CQ

MARCH, 1948

The Radio Amateurs' Journal

35¢

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CRYSTAL MICROPHONE

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Send for Catalog and Selection Guide No. 101

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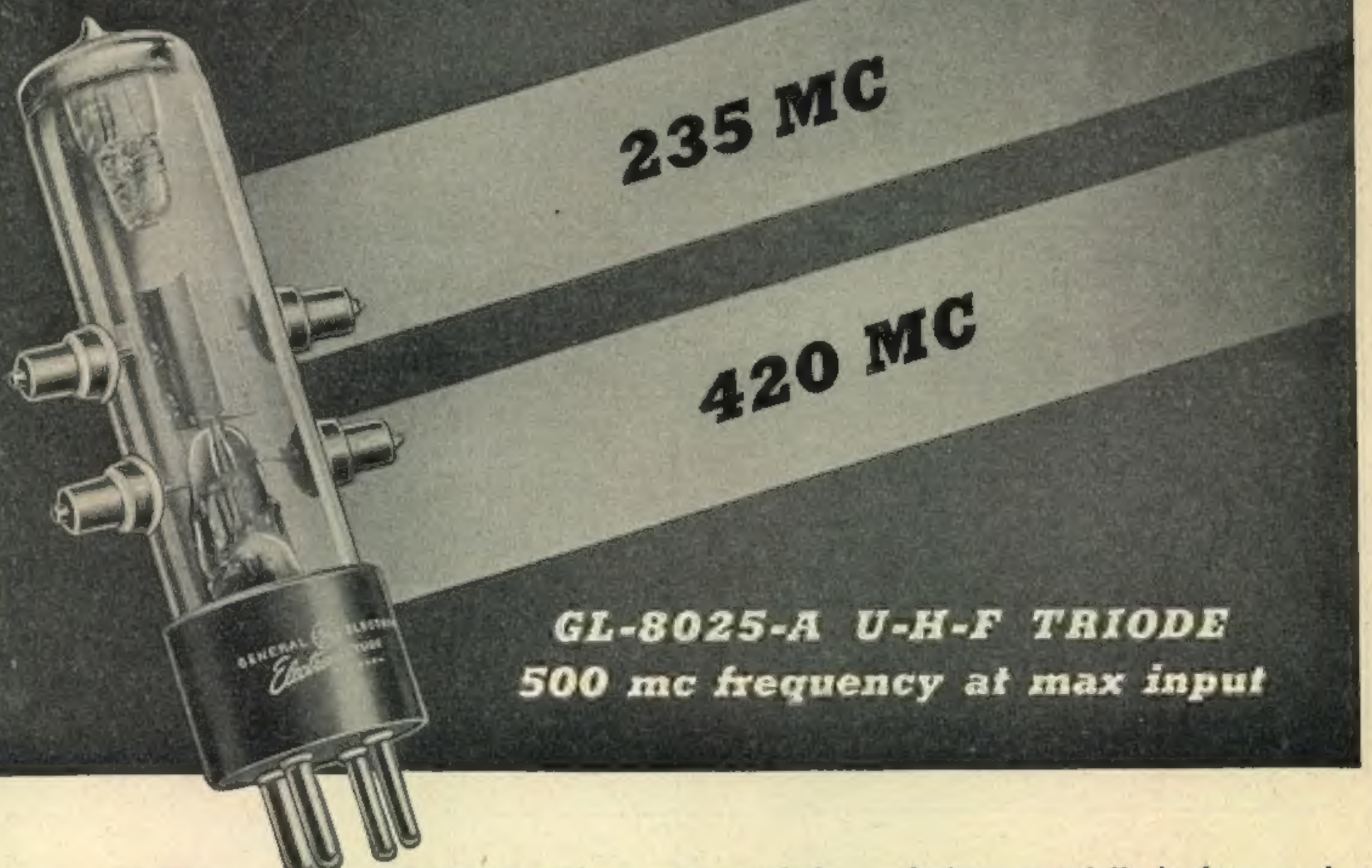
Buchanan, Michigan

Export Division: **13 E. 40th St., New York 16, N.Y., Cables: Arlab**

NO FINER CHOICE THAN

Electro-Voice

FOR THOSE NEXT TWO BANDS...



HAMS seldom are satisfied — which of course means radio progress. Now that long-distance contacts are an old story on 6 and 2 meters . . . how about 235 mc (1¼ meters) and 420 mc (¾ meter)? What is needed to get on the air on those bands?

It's clear that your lower-frequency equipment won't serve. A new circuit and new components are called for, with spotlight falling on the power tube.

Type GL-8025-A takes the center of the stage by reason of (1) a frequency range up to 500 mc at max ratings, (2) adequate power—50 w max CW input, (3) advanced design, especially in features that contribute to low lead inductance, so important in u-h-f work.

Note, for example, the double side leads to plate and grid, extremely short; also the center-tapped filament, by means of which you can cut filament-lead inductance to a minimum.

Inspect this modern u-h-f power triode at your G-E tube distributor's. And get ready for a pleasant surprise when you ask the price, for the GL-8025-A is another G-E *top tube value! Electronics Department, General Electric Company, Schenectady 5, New York.*

GL-8025-A

ELECTRICAL CHARACTERISTICS

Filament voltage	6.3 v
current	1.92 amp
Interelectrode capacitances:	
grid-plate	3.0 mmfd
grid-filament	2.7 mmfd
plate-filament	0.4 mmfd
Frequency a. max ratings	500 mc

Ratings (ICAS) for typical operation

R-f oscillator, Class C Telegraphy

Plate voltage	1,000 v
current	50 ma
Grid voltage	—90 v
Power output	35 w

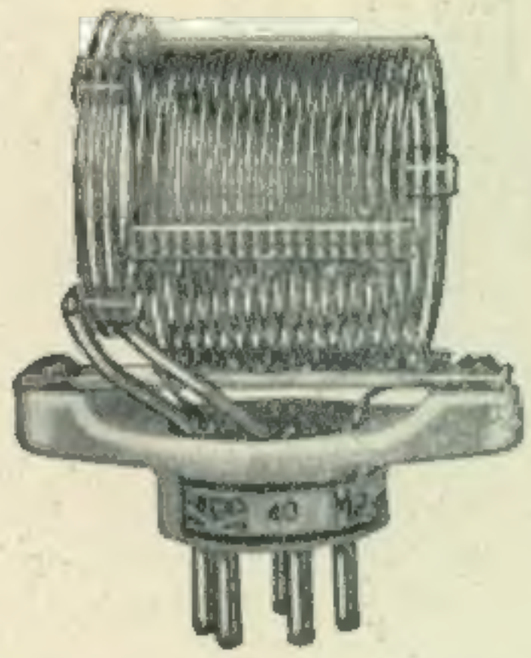
March-April issue of Ham News is called the "gadget edition" because it describes a whole group of novel devices to add to your satisfaction as a ham—a miniature volt-ohmmeter, a field-strength meter, and many others. Don't miss this idea-packed issue, which will be available shortly. Ask your G-E tube distributor to reserve a copy for you.

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

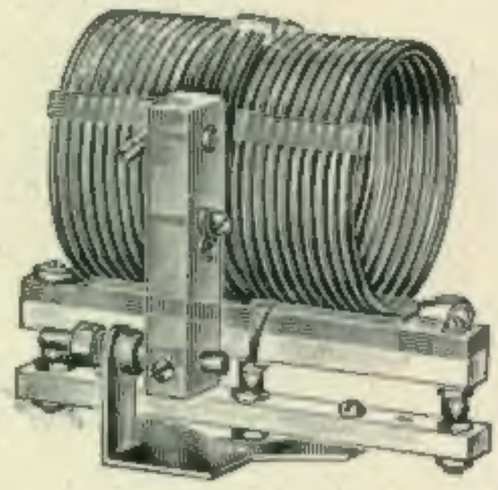
GENERAL ELECTRIC

161-GA3-6650

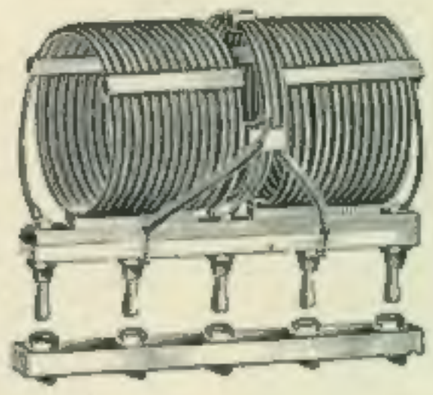
BUD COIL PRICES are LOWEST now!



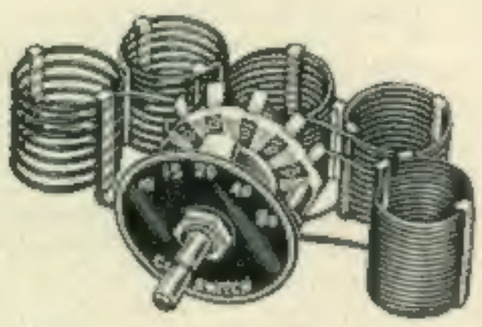
VARIABLE END-LINK COILS



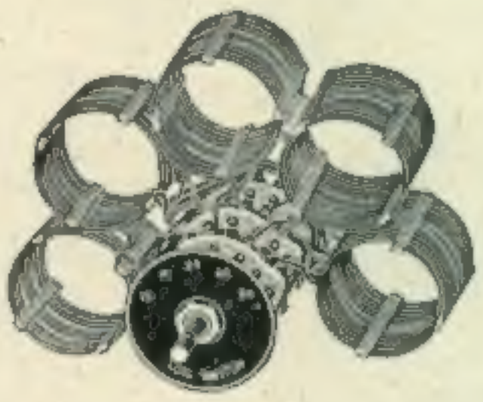
VARIABLE LINK TRANSMITTER COILS



ADJUSTABLE
LINK TRANSMITTER COILS



50 WATT BAND SWITCH ASSEMBLY



100 WATT BAND SWITCH ASSEMBLY

NOW IS THE TIME to take advantage of the low prices on BUD coils—the lowest in the market today. The unsurpassed quality of BUD coils has not been sacrificed . . . production economies enable savings in operating costs to be passed along to you in the form of lower prices. Now, when prices are high, savings are more important than ever to you. Get more value, more of the things you need by buying BUD. Get acquainted with the BUD line by sending coupon below for new catalog today!

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The mark BUD *of perfection*

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Company.....

Address.....

City.....State.....

CQ

The Radio Amateurs' Journal

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Vol. 4 **MARCH, 1948** **No. 3**

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COVER—Power? Using the equipment described in "A Mile Per Milliwatt," beginning on page 24, the gang start the first call and initial tune-up on Mt. Greylock. W1ILS with the headphones and W1OTH giving the call through the handset, W1NBL sitting with W1PRS directly behind him, and W1PAW standing behind W1ILS comprise one of the two groups participating in these microwave tests.

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What...

HALLICRAFTERS MODEL HT-18 VARIABLE MASTER OSCILLATOR DOES FOR *IMPROVED* AMATEUR TRANSMISSION

The HT-18 is called by hams who have used it the most efficient, flexible piece of gear to be developed in recent years. Easily added to your present transmitter, it brings it right up to date. Narrow band FM and calibrated 5 band V.F.O. complete in one compact cabinet with all coils and power supply concentrates and simplifies your entire operation. Put your transmitter anywhere, place the neat, highly functional HT-18 on the operating table and you're in action. Narrow band FM quality like you've never heard before. The HT-18 places your signal *anywhere in the band* with excellent stability. Go to your nearest Hallicrafters distributor today for a demonstration and complete technical data on this splendid instrument.

EASY, PRECISE, FLEXIBLE OPERATION FOR THESE REASONS:

- Provides narrow band FM phone transmission equivalent to *best* AM phone transmission.
- Converts any good CW transmitter to a high quality phone transmitter.
- Eliminates 90% of broadcast interference.
- Puts your signal *anywhere in the band* with stability equal to best crystal controlled transmitter.
- Gives you direct calibration, direct output on all bands 80, 40, 20, 15, 11, 10.
- Simplifies operation of entire station. Puts both frequency selection and power control at your finger tips. 72 ohm output. Remote power control terminals.

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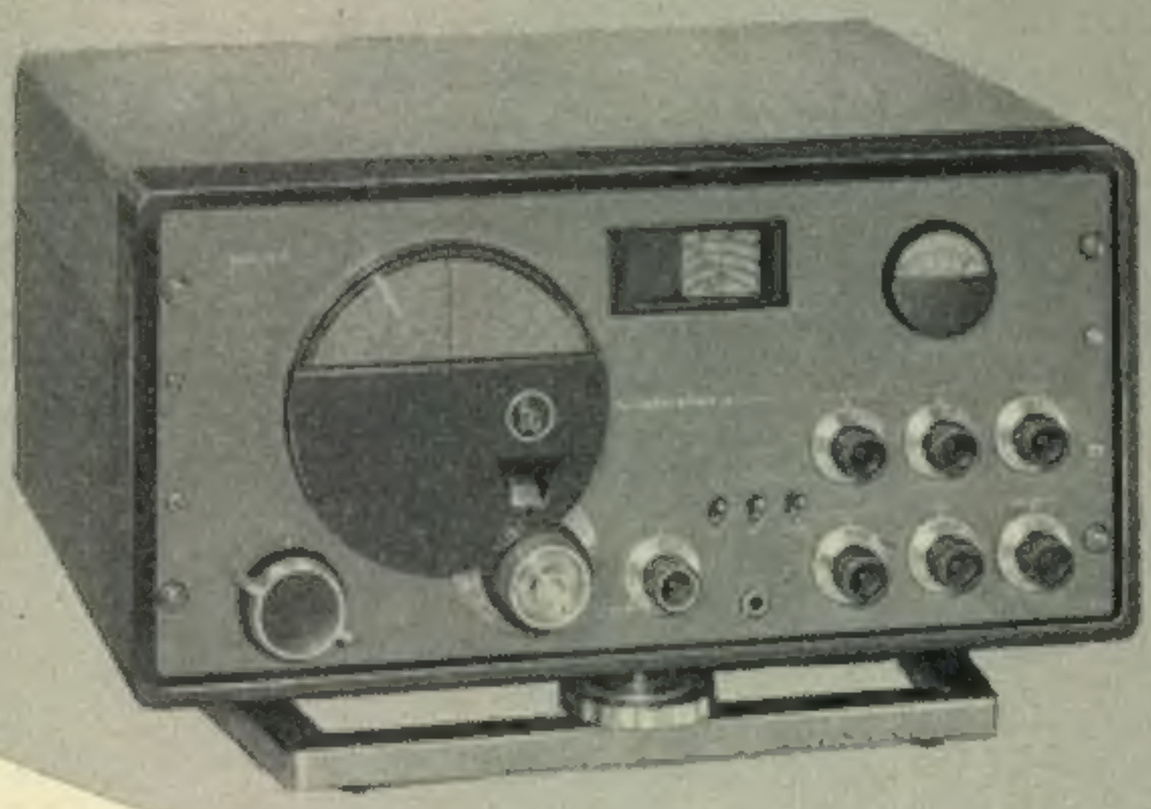

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FREQUENCY COVERAGE
FROM 540 kc TO 110 Mc
IN 6 BANDS: AM—FM—CW

MODEL
SX-42

Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc in six bands AM, FM, CW—with exceptionally fine performance on CW. Offers in one superbly engineered, precision instrument a top flight standard and VHF communications receiver; standard, short wave and FM broadcast receiver. Freedom from drift and maximum stability are provided by temperature compensation and the use of a type VR-150 voltage regulator tube. The tremendous frequency range is made possible by the development of a new "split-stator" tuning system and the use of dual intermediate frequency transformers.

ALL THE ESSENTIAL
AMATEUR FREQUENCIES
FROM 540 kc TO 108 Mc

MODEL
SX-43

The SX-43 provides custom quality, precision engineering, excellent performance and wide frequency range at a medium price. The SX-43 offers continuous coverage from 540 kc to 55 Mc and has an additional band from 88 to 108 Mc. AM reception all bands. CW on four lower bands and FM on frequencies above 44 Mc. In the band 44 to 55 Mc, wide band FM or narrow band AM, just right for narrow band FM reception, is provided.

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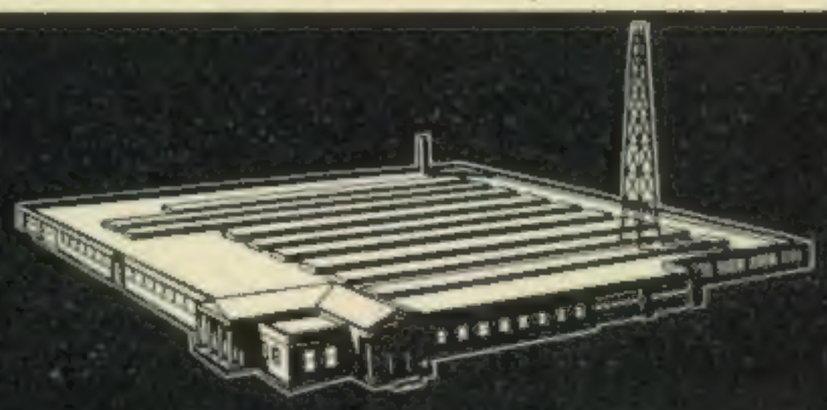

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Application

90811 HIGH FREQUENCY

RF AMPLIFIER

The No. 90811 RF Amplifier is the same unit as used in the No. 90810 complete 2–6–10–20 meter Ham Band crystal controlled transmitter. Can be panel or base mounted. Uses 829B or 3E29 tube with normal 75 watt output. (Higher output may be obtained by the use of forced cooling.) Provisions are made for quick band shift by means of the new 48000 series high frequency plug-in coils. Extremely compact. Chassis 4" x 7¾" exclusive of flanges. Over-all height 6¾".

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★ ★ ★ Letters ★ ★ ★

Making the Most of Our Bands

927 E. 23rd., Erie, Pa.

Editor, *CQ:*

Regarding proposed widening of 75-meter phone band and 7-mc phone*, the following points must be kept uppermost in mind:

1. Any widening of 75-meter phone will result in further widening of Canadian 75-meter phone band, meaning additional losses for c.w.

2. 7-mc phone will QRM broadcast stations now operating there, and while on the surface this seems desirable, will this not be a strong point in favor of removing that shared portion of the band entirely for amateur use? Phone would not then take this loss, but will come up with further demands for remaining portion of the 7-mc band.

I believe these factors must be considered before any action is contemplated.

Raymond Rosenberg, W3NCJ

---

56 Pennsylvania, Friendship, N. Y.

Editor, *CQ:*

How about a slogan for ham radio for the next conference and print it on the cover of *CQ*? The time to take action is now, and not when the conference begins. We went into the last conference asking only for that which we had, and lost our shirt. At the next one we should go into it asking for the whole spectrum. In doing this we will keep the other interests so busy in trying to prevent the hams from expanding their frequencies that we may be able to expand a bit.

About 7.2 to 7.3 mc—yes, it should be thrown open to any form of experimenting that the amateur wishes to conduct. If we can blanket the propaganda stations they will move out. You can't do it with c.w. and phone alone. Have more editorials like that in December *CQ*. There is no question but that editorial expressed what is uppermost in the hams' mind. We are not sharing 7.2–7.3—we are being pushed out of that band.

How about changing the present regs so that the first license issued would be Class C which would limit operation to c.w. only for one year; then a Class B would be automatically granted? A "mail order" license would be only Class C (limited to c.w.) and the licensee would have to go to an RI for a Class B to work phone.

I think that 80 meters should be limited in regard to power; say about 250 watts maximum, and be opened to Class B. The band should be extended from 3.75 to 4 mc. Class A tickets should be mandatory for inputs of 500–1 kw phone. I think we are using too much power and should use low power on the clear bands.

What do you think of limiting our power on week-ends?

William Rieger, W2YLF

Ideas for a QSO

53 E. 7th St., Holland, Mich.

Editor, *CQ:*

Many suggestions could be made in regard to increasing our fun and enjoyment in ham radio. In this letter a few things are mentioned, and it is

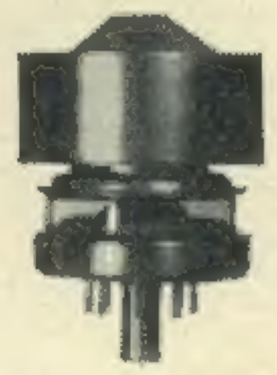
---

*"*Zero Bias,*" CQ, Dec., 1947, p. 11.*

EIMAC TETRODES

4-65A

4X100A

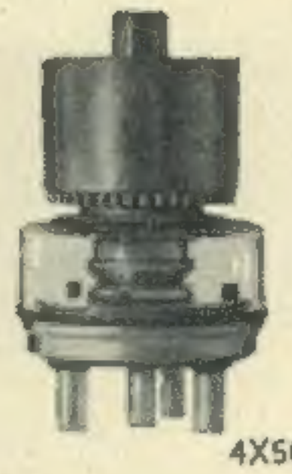


4X150A

4-125A

4-250A

4-400A



4X500A

4-1000A

PERFORMANCE LEADERS

⊙ THESE TUBES HAVE PYROVAC PLATES

4-65A

Tops for high power VHF mobile transmitters, type 4-65A is the smallest of the Eimac radiation cooled tetrodes. Conservatively rated at 65 watts plate-dissipation, the tube is but 4¼" high and 2" in diameter. The 4-65A is capable of operation over a wide voltage range, for instance at 600 plate volts one tube will provide 50 watts of power-output with less than 2 watts of grid drive. At 3000 plate volts a power-output of 265 watts is obtained.

4X100A

Designed for high frequency applications in which horizontal forced-air cooling would be an equipment design advantage. The characteristics of the 4X100A closely resemble those of the 4X150A except for slightly lower plate dissipation, 100 watts.

4X150A

An extremely compact tetrode of the air-cooled external anode type. Rated at 150 watts of plate dissipation it can be operated at maximum ratings up to 500-Mc. When operated as a doubler, the 4X150A is the standout answer to the STL (studio- transmitter-link) vacuum tube problem . . . excellent performance is had up to 1000-Mc.

4-125A

Forerunner of the Eimac tetrode line, the 4-125A is probably the most universally accepted power tetrode yet designed. Its Pyrovac plate and processed grids impart a high degree of operational stability, resistance to overloads and exceptionally long life. Rated at 125 watts plate dissipation, one 4-125A will handle 500 watts input with less than three watts of grid drive.

4-250A

Higher power version of the 4-125A, type 4-250A also incorporates a Pyrovac plate, and processed grids. In typical class-C operation one tube with 4000 plate volts will provide 1 kw of output power, with 2.5 watts of grid drive.

4-400A

Specifically created for FM broadcast service, two 4-400A tetrodes in typical operation, at frequencies in the 88-108 Mc FM broadcast band, will provide 1200 watts of useful output power, at 3500 plate volts, while the dissipation from the Pyrovac plate is considerably under the maximum rating of 400 watts per tube.

4X500A

A small, but high power VHF, external anode type tetrode, rated at 500 watts plate dissipation. The low driving power requirement presents obvious advantages to the equipment designer. Two tubes in a push-pull or parallel circuit provide over 1½ kw of useful output power with less than 25 watts of drive.

4-1000A

Currently the largest of the Eimac tetrodes, its pyrovac plate is rated at 1000 watts dissipation, the 4-1000A has the inherent characteristics of all Eimac tetrodes—dependability, stability, optimum performance and economy of operation. Type 4-1000A is ideally suited for high-level audio service as well as r-f applications.

Complete data on these tetrodes and other Eimac tube types may be had by writing direct.

EITEL-McCULLOUGH, Inc.
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EXPORT AGENTS: Frazar & Hansen—301 Clay St.—San Francisco, Calif.

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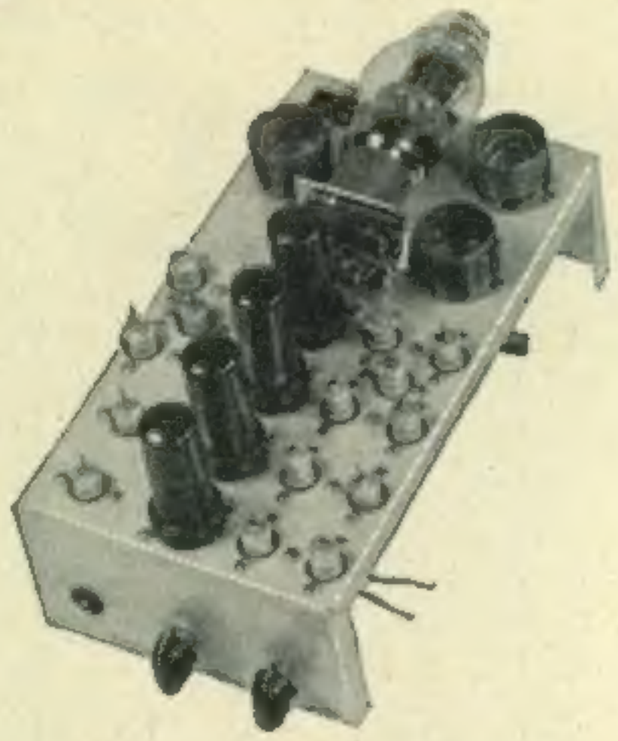
Eimac TUBES

The Power for R-F

McMurdo SILVER

MODEL 703
PRE-TUNED FREQ. MULTIPLIER



In shipment at last, Model 703 is the answer to fast transmitter band change. Fed by any 80 meter oscillator, a flip of two knobs gives 40 watts output 80 thru 10, and 18 watts on 6 meters. See October, 1947 QST. Only **$49.90** less 2—6AG7, 2—6L6, 1—807 tubes and power supply.

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MODEL 701 TRANSMITTER

Goes into more amateur stations to produce more CW and phone DX than anything else, it seems. A 6AQ5 Tritet drives an 807 to 75 watts CW, 30 watts phone, input; 80 through 6 meters. Modulator is built-in. Less coils (3 per band at $.50 ea.), power supply, 4 tubes and crystal, it's the outstanding transmitter "buy" at **$36.95.**

MODEL 903 ABSORPTION WAVEMETER

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EXECUTIVE OFFICES: 1240 MAIN ST., HARTFORD 3, CONN.
FACTORY OFFICE: 1249 MAIN ST., HARTFORD 3, CONN.

suggested that comments be made on them by other hams.

One of the most interesting things is to have a knowledge of the other hams who you work or know. This at present is only possible by actually asking the other fellow what his other hobbies are and what he has for an occupation. Therefore, something should be done in regard to this and that would be a publication on the other hobbies of hams as well as their occupations. Perhaps some publisher will make this possible sometime and if it is ever done an alphabetical listing should be made under each different hobby as well as a call letter listing of the same so it can be referred to in a QSO. For instance, under "photography" all hams who are very much interested in this hobby could be listed under this heading and behind their call in the call letter listing this could also be listed.

Another suggestion is that this same idea could be carried out in the ham magazines *CQ* and *QST*. A listing of all stations having recording apparatus could be listed and if a fellow would want a recording of his fist or mike quality he could ask these stations listed. Naturally, a small contribution should be given to the station making the recording to cover his expenses. Recorders are on the increase and this would make our hobby more interesting. Most hams have never heard their "fist" or "mike quality" and this recording could give a fair idea of what it is like.

Another idea would be that all stations that are on the air almost every day or on the air a great deal of the time during the week could be listed and the time of operation and frequency listed. In order to get into this listing a station must be on the air a certain number of hours each week and be able to give a special time and frequency that station is operated thus allowing a better chance of contacting that station and also improving traffic conditions. This would be also for foreign stations as it would make DX more readily possible with certain hard-to-get countries.

Another idea would be a list of stations published who answer exchange of station photos 100%. This would help other fellows get an idea of how the various ham stations are built. Magazines do not have space to publish but a few of the stations photographs. This would make it possible to have a big album of other ham stations and actually see them while in contact or getting ideas for rebuilding the rig.

These are but a few suggestions and others would be useful such as a list of stations who actually do QSL 100% and who are put into a listing so that their good efforts are rewarded. Additional suggestions by those who read this will be welcomed.

Rus Sakkers, W8DED

The True Ham Spirit

U. S. Marine Hospital, Neponsit, L. I., N. Y.

Editor, *CQ:*

You surely were right! We received about two dozen offers of equipment. We accepted two offers, and we are already operating on 40 c.w. Soon we hope to be on 20 and 10 phone.

We want to thank *CQ* so much for its part* in helping us to get on the air.

Fred M. Parry, W2MDF
A. L. McMullen, W6YDO
Hong H. Lem, W2TCE

*"*Letters*," CQ, Dec. 1947, p. 6.*

Now! BIG RECEIVER QUALITY IN THE LOW-PRICED FIELD!!

THE NEW NATIONAL NC-33 $65.95 AMATEUR NET

Here's the receiver you've been waiting for! A real communication receiver covering all frequencies from 500 kcs to 35 mcs, the brand new NC-33 offers the same fine workmanship that distinguishes National's more expensive receivers. Dollar for dollar, feature for feature, it's better built, better looking, better performing! See it — compare it — today at your dealer's. You'll decide it's the perfect choice for your shack, living room, playroom or den!

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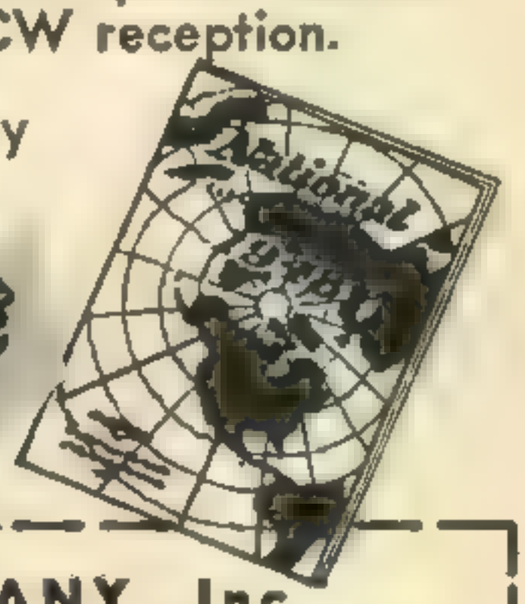

National

EST. 1914

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MALDEN, MASSACHUSETTS

NATIONAL COMPANY, Inc.
61 Sherman St., Malden 48, Mass.

Gentlemen: Please send me your new 1948 catalog of National receivers, components and parts.

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STREET .....

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the SHURE "VERSATEX"

1. Fits snugly in your hand—is its own desk stand—sits on the table top by itself—threaded to mount on standard floor stand.
2. Has specially engineered "Voice" response. Ideal for HAMS, Paging Systems, Home Recording, Low-Cost P. A. Systems.
3. Has high output level. 53db below 1 volt per dyne per square centimeter. (Level measured at end of a 7-foot cable.)
4. Has special moisture-proofed crystal.
5. Contains R-F filter to prevent crystal burnout.
6. Has heavy, rich maroon-colored plastic case—prevents shock.

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Model 718A $11.50 LIST

SHURE SHURE BROTHERS, Inc.

Microphones and Acoustic Devices

225 West Huron Street Chicago 10, Illinois

Cable Address: SHUREMICRO

Feenix, Ariz.

Deer Hon. Ed.:

Tuning on hams bands are sumtimes making Scratchi disgusteded with himself. For examples I are always heering one hams say to fellow he working—"you are putting the S meter over against the pin" or "you are coming in here like a local." No one ever giving Scratchi good reports like that, despite 5 kilowhats final. So, I are deciding to dew sumthing to give my sigs a little local color. (So I are cuming in like local, get it, Hon. Ed.?)

My first reactshun is to fix up reel fancy rig in car and take a trip all over the country, so I can drive up outside ham shack and reely come in like a local. I are talking this over with Brother Itchi, but he are diskouraging it quick-like on account it taking lots of monies, and at present the exchecker are flatter than ham who just got across three thousands volt power supply.

I are deciding that the answer only cums from using beter antennas. This thought are running back and forth in mind like r-f in tank circuit, when suddenly a reel brite idea starts calling seek-you in Scratchi's noggin. What I are needing is antenna which are going all over the countries. This are not as hard as it sounding, and I are reel quick running to shack to try out my stoopendous idea. First I are running lead from final tank coil through high voltage condenser, then I are attaching this lead to fence which are going around Itchi's ranch. Next I are getting Itchi to drive me to where fence cums to railroad tracks. Here I am running lead from fence to one of the tracks. Hee hee, getting idea, Hon. Ed.? Scratchi are now having long-wires antenna what are running all over Yewnited States, where ever railroad tracks go.

After returning to shack, Itchi giving me good suggestion, so we also run another wire and hook it into telefone lines. Itchi are thinking that because railroad tracks are all on ground except where going over bridges, that maybe telefone wires adding to higher angle of radiation. Being all set, I tune up hole system as a long wire, and find that final are loading up reel nice. So, I send out seek-you on 80 meters. Hoken-Smokey, I are never heering so many signals on band before. And Hon. Ed. you will finding this hard to believe, but they are all calling Scratchi!! I are so confused that I are forgetting to answer anyone. I call a quick QRZ and there are hole band back calling me again.

Scratchi decide to go back to a W4 in Florida. This fellow giving me S-nine plussedly plus but say he not believing that I'm in Arizona on acct. he first heard me on 10 meters, then he checked and found my sigs on 20, 40 and 80. He are saying that my sigs are so loud he knows I'm a local. Then he are signing off in a huff on account he thinks Scratchi are one of the local hams who are playing meen trick on a new ham.

(Continued on page 89)

Now . . . heavy duty Features in new small

B&W

BUTTERFLY VARIABLE CAPACITORS

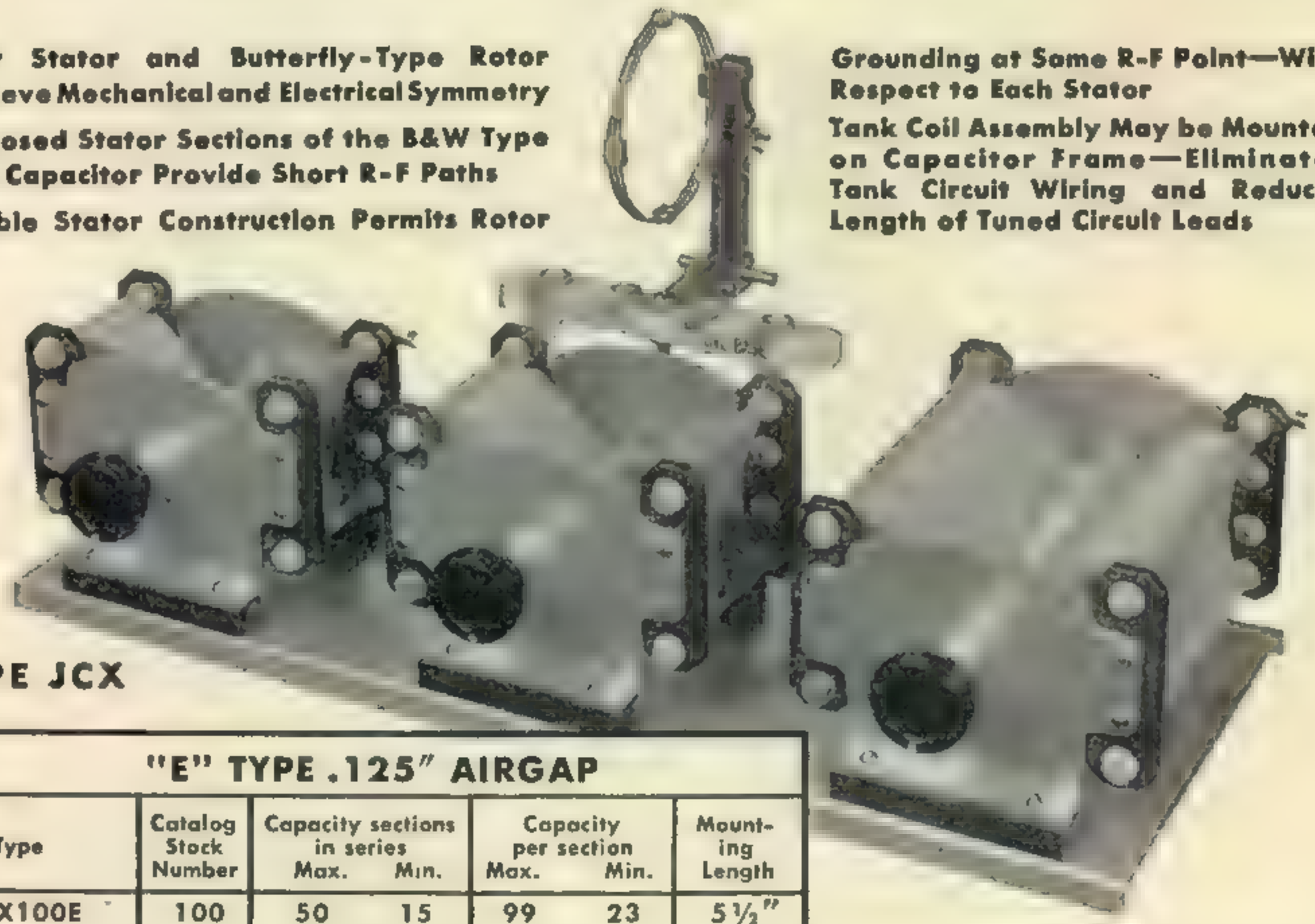
No other Capacitor of this size offers all these features!

Split Stator and Butterfly-Type Rotor Achieve Mechanical and Electrical Symmetry

Opposed Stator Sections of the B&W Type JCX Capacitor Provide Short R-F Paths

Double Stator Construction Permits Rotor Grounding at Some R-F Point—With Respect to Each Stator

Tank Coil Assembly May be Mounted on Capacitor Frame—Eliminates Tank Circuit Wiring and Reduces Length of Tuned Circuit Leads



TYPE JCX

"E" TYPE .125" AIRGAP						
Type	Catalog Stock Number	Capacity sections in series Max.	Min.	Capacity per section Max.	Min.	Mounting Length
JCX100E	100	50	15	99	23	5½"
JCX50E	101	25	10	42	13	3⅜"
JCX25E	102	16	8	25	10	2¾"

Now — the popular B&W split stator, butterfly type of variable condenser construction has been adapted to small, compact units for medium power stages of up to 250 watts.

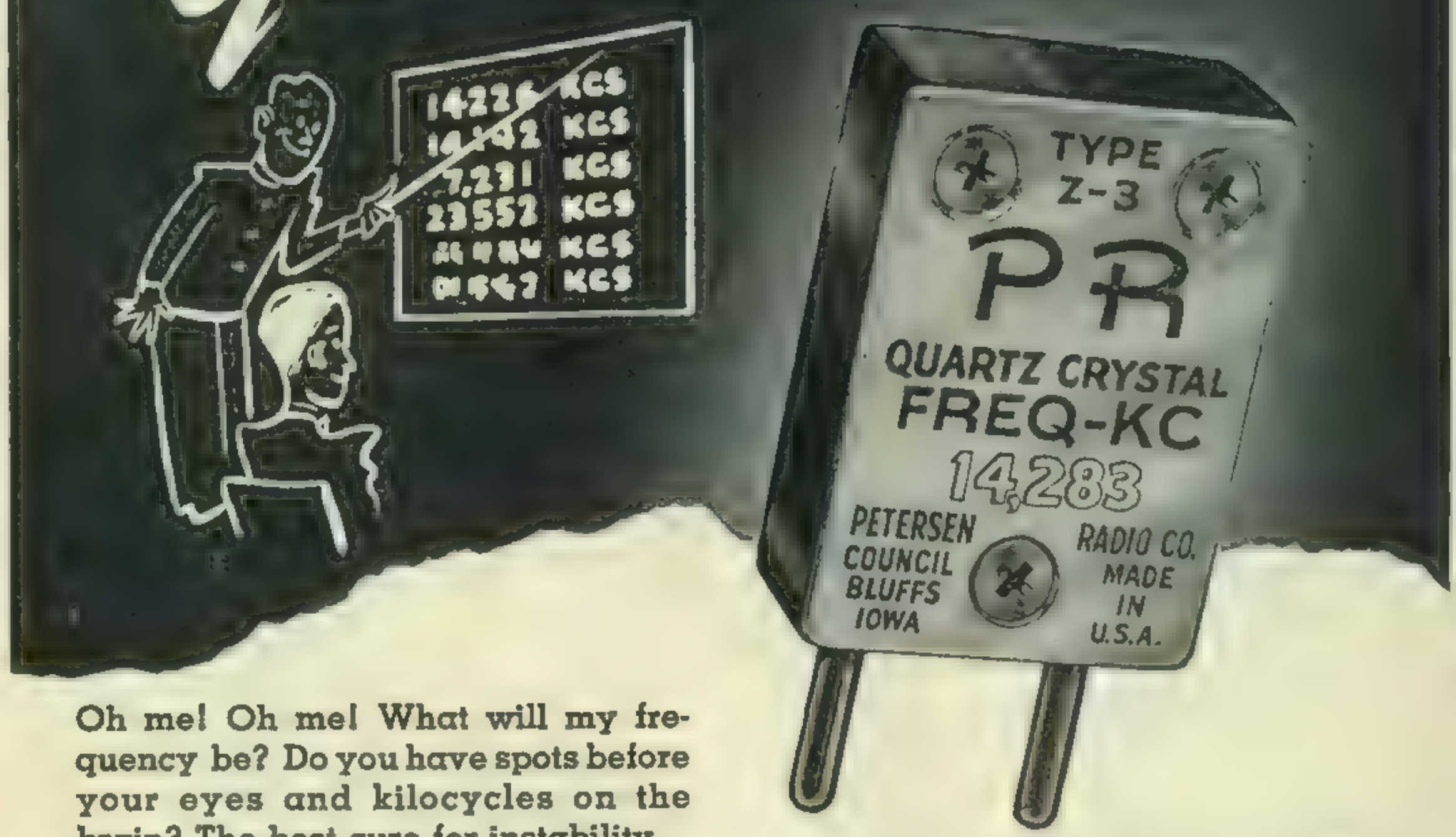
Having just 25% of the frontal area of the famous heavy-duty CX types, these new B&W JC Variable Capacitors are ideal for triode or tetrode stage plate circuit applications where modulated plate voltage does not exceed 1250 volts and unmodulated plate voltage 1500 volts.

Featuring stainless steel shafts, heavy, rounded aluminum plates and high quality insulating materials, these new B&W Butterfly capacitors bring top features . . . top performance to the amateur who is looking for peak efficiency in low and medium power transmitter stages. *Write for complete details.*

BARKER & WILLIAMSON, INC.

237 Fairfield Ave., Dept. CQ-38, Upper Darby, Pa.

...Spots Before Your Eyes



Oh me! Oh me! What will my frequency be? Do you have spots before your eyes and kilocycles on the brain? The best cure for instability—sometimes known as "where-am-I-hope-it's-in-the-band" — is positive CRYSTAL CONTROL WITH PRs! Yes, PR Precision CRYSTALS give you peace of mind, because when you have a PR in your rig you KNOW WHERE YOU ARE . . . and your friends do, too! You can get PRs at your jobber's for the exact frequency you want (integral kilocycle) within amateur bands at no extra cost! Tens of thousands of amateurs all over the world use and boost PR. Precision CRYSTALS for accuracy, stability, low cost, dependability and activity. They're unconditionally guaranteed. —Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Iowa. (Telephone 2760)

PR Precision CRYSTALS SINCE 1934

10 METERS PR Type Z-5.	Harmonic oscillator. Ideal for "straight through" mobile operation. High activity. Heavy drive without damage in our special circuit $5.00
20 METERS PR Type Z-3.	Harmonic oscillator. Low drift. High activity. Can be keyed in most circuits. High power output. Just as stable as fundamental oscillators $3.75
40 & 80 METERS PR Type Z-2.	Rugged, low drift fundamental oscillators. High activity and power output with maximum crystal currents. Accurate calibration..$2.75

ZERO BIAS

EDITORIAL

The Growing Threat of TVI

THE GROWING MENACE OF television interference to the security of amateur radio is underscored by the announcement of new production records by all of the manufacturers of television sets. As production increases so does the dollar investment, which leads to the rather obvious conclusion that television in its present form and on existing frequencies is here to stay. That the seriousness of the situation is understood by many of the A.R.R.L. officials is pointed up by the very excellent brief presented by A.R.R.L. before the F.C.C. during the November 17th hearing relative to TVI. But as yet there has been no relief from the constantly growing pressure being brought on amateurs living within the service area of existing television stations.

One of the direct results of amateur TVI, and perhaps the most disastrous, is the fact that, regardless of the source of television interference, the amateur is blamed. By far the majority of cases of television interference are not being caused by amateurs But there probably is not an amateur with television sets nearby who hasn't had scores of telephone calls and indignant protests when his rig was as cold as this winter's weather.

We know of one instance where a group was observing a television show for children. When the picture became blurred, one of the adults in the audience arose and roundly denounced a certain ham, demanding a civil suit and united action by the parents. The fact that this television receiver was over 10 miles from the ham's station made no apparent difference to this ignoramus. Then to this man's complete chagrin the amateur, himself, who happened to be right there with his own youngsters, stood up and, needless to say, ably defended himself. But it isn't often that the ham is given an opportunity to defend himself.

There seem to be several courses of action that a ham can take at present. One is to request that the local office of the F.C.C. explain the law to TVI complainants. These listeners do not seem to realize that a log must be kept of all transmissions from an amateur station. This log is incontestible proof of amateur operation, or inoperation. TV listeners, when they file a complaint, should be required to supply the F.C.C. with specific dates and times when they suffered interference. This information should be made available to the ham and the F.C.C. should be asked to corroborate the data. It is high time that we put an end to the viciously unfair practice of charging to the ham every bit of TVI not definitely traceable. Under no circumstances should the amateur permit a complaint to be passed off without some official expression on his part. In too many instances the amateur is investigated and exonerated of the complaint, but the television listener is not made emphatically aware of this.

Another step, perhaps too drastic for the average ham to take but justified in some instances, is to obtain the services of a good attorney and prosecute a disorderly conduct charge against the annoying TV set owner if he persists in becoming a nuisance. When taking such a step you've got to be armed with facts, and an accurate log is first-rate evidence. But television set owners experiencing trouble must learn that the amateur is not meant to be the butt of their problem. Resorting to court action may be drastic, but many television listeners, aided and abeted by incompetent servicemen and overly exuberant advertising copy by set manufacturers, are expecting too much from their sets—and are asking for drastic action.

Call It What You Want

You wouldn't believe it, but there are some embryo hams who don't even know what a junk box is. A month ago we moved into a new house. Naturally, when one moves it is the custom to throw out accumulated odds and ends. When we came to the radio gear it was obviously impossible to even consider throwing out anything. But once in the house, in the interests of a neat basement we tackled the job of eliminating the junk box.

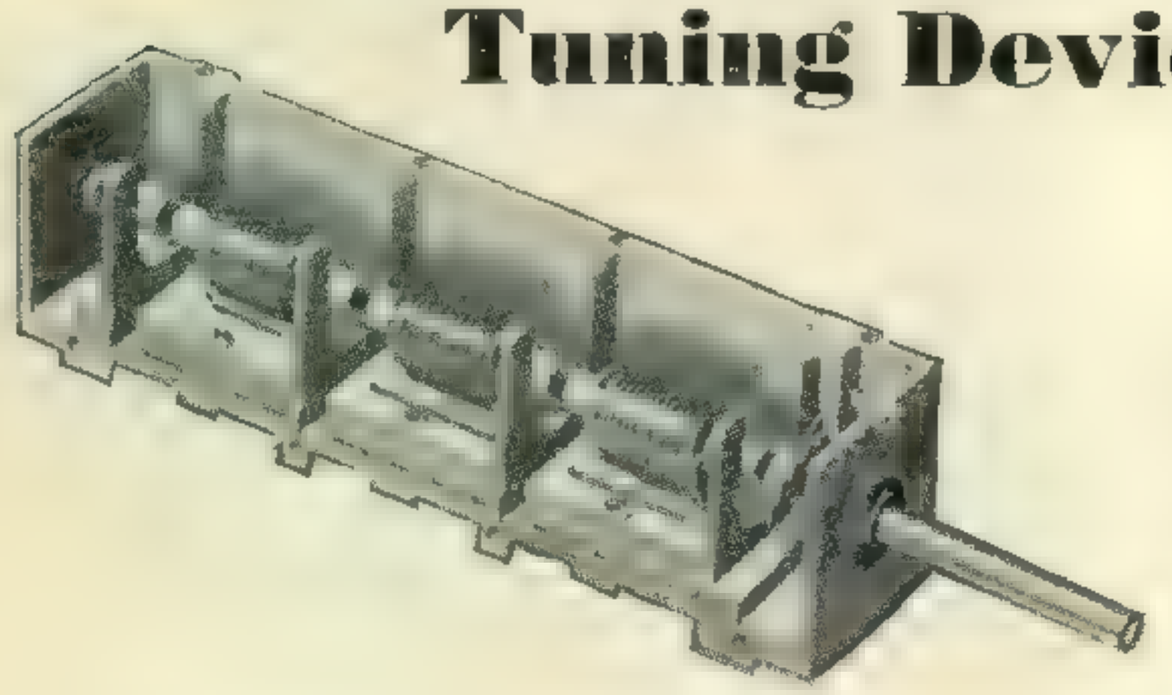
Did you ever stop to realize how much needless money is invested year after year in equipment later discarded. From our calculations most of the useless or discarded parts were purchased during the formative days. We didn't know any better and the results, certainly not unique, were this sad looking collection of beat-up gear. The hams who time after time have found that "one" missing part in such a collection probably have their hackles up at this point. But notwithstanding the junk box advocates, we feel that the least expensive way to accumulate components is to buy them for their widest possible applications.

Something can be done about it. You will notice, starting with the May issue of CQ, that parts lists will be reproduced in two different type faces. Parts which must be duplicated exactly will be carried in bold face. By exact duplication we don't necessarily mean using a specific manufacturers 5000-ohm resistor. But if it must be 5000 ohms, within the usual tolerances allowed in manufacturing, we'll put the unit in bold face. Parts which can be any reasonable value so long as it approaches the original value will be listed in a light face type. Should there be extreme tolerances allowed, for example anything within 50% of a stated part, we will indicate this in the parts list.

Yes siree, it won't be long before the young squirt won't even get a chance to find out what a junk box is.

MALLORY HAM BULLETIN

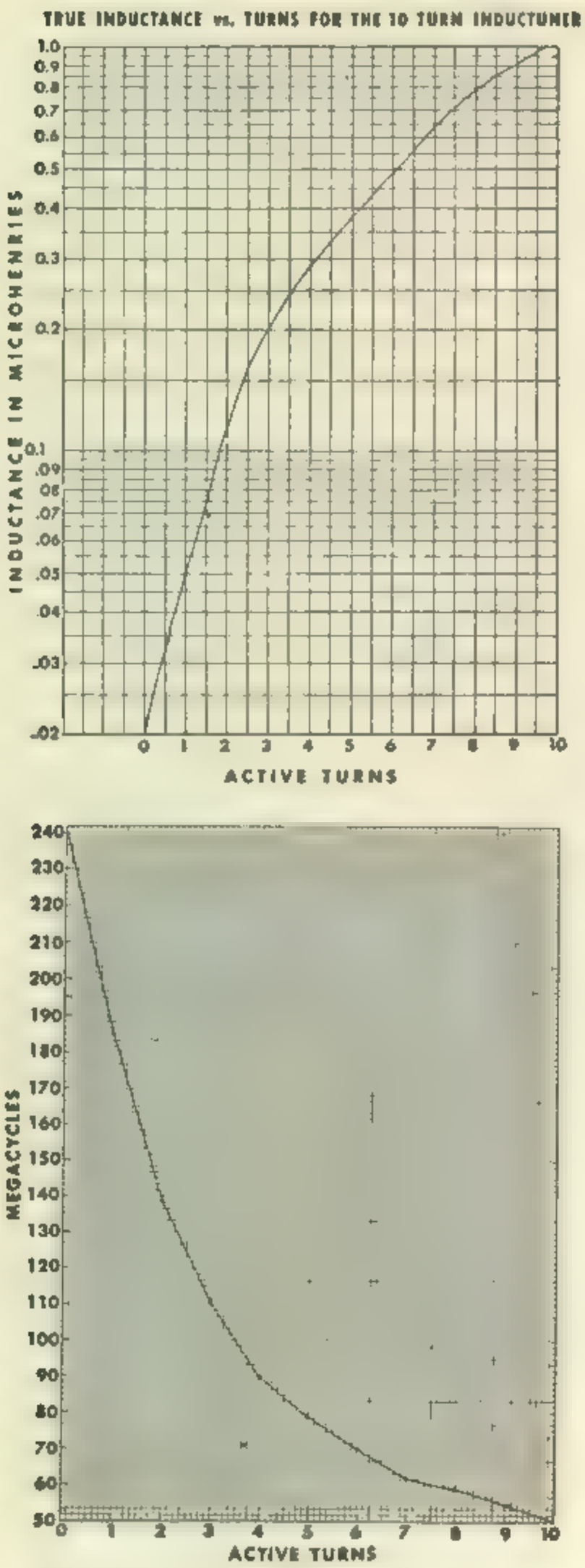
The Mallory 3-Gang INDUCTUNER* Tuning Device as an Amateur VHF Tuner



FOR some time Mallory has been building and supplying the Television Industry with a 3 coil, variable inductance tuning device, called the Inductuner. This unit consisting essentially of 3 precisely wound coils each equipped with slider shorting mechanisms, mounted on a single, panel controlled shaft, has proven to be eminently successful in providing continuous tuning over the entire TV and FM range of 44 through 216 Mc.

The Inductuner tuning device, equipped as it is with the mechanics for varying the inductance of each of its 3 coils continuously, accurately and smoothly, from the front panel, provides all essentials for tuning without recourse to variable condensers, band-switches or plug-in coils. The elimination of these "extra" parts from the VHF circuit not only simplifies wiring, but also, and more important, reduces the length of RF wiring to practically an irreducible minimum . . . and further, it permits use of a maximum of inductance with a minimum of capacitance at all frequencies tuned. The serious VHF worker will recognize immediately the advantage this condition supplies for improved efficiency at the Very High Frequencies.

After we observed the efficient manner in which the Inductuner tuning device provided the Television Engineer with entirely practical tuning of the 44 through 216 Mc band, the decision was made to investigate the possibilities this tuner might offer to the Amateur designer. Accordingly, a Converter using the Inductuner tuning device as its basic tuning element was constructed. As a result of considerable experimentation a tube line-up consisting of a 6AK5 TRF, a 6AK5 Mixer and a 6J6 two terminal oscillator was selected as giving best results for Amateur service. In order to include as many Amateur VHF bands as possible, the original TV-FM frequency coverage was modified for 50 through 240 Mc (6, 2 and 1¼ meters) operation. The IF of this unit was 11 Mc.



Calibration Curve of Inductuner Converter

Registered Trademark of P. R. Mallory & Co., Inc., for inductance tuning devices covered by Mallory-Ware patents.

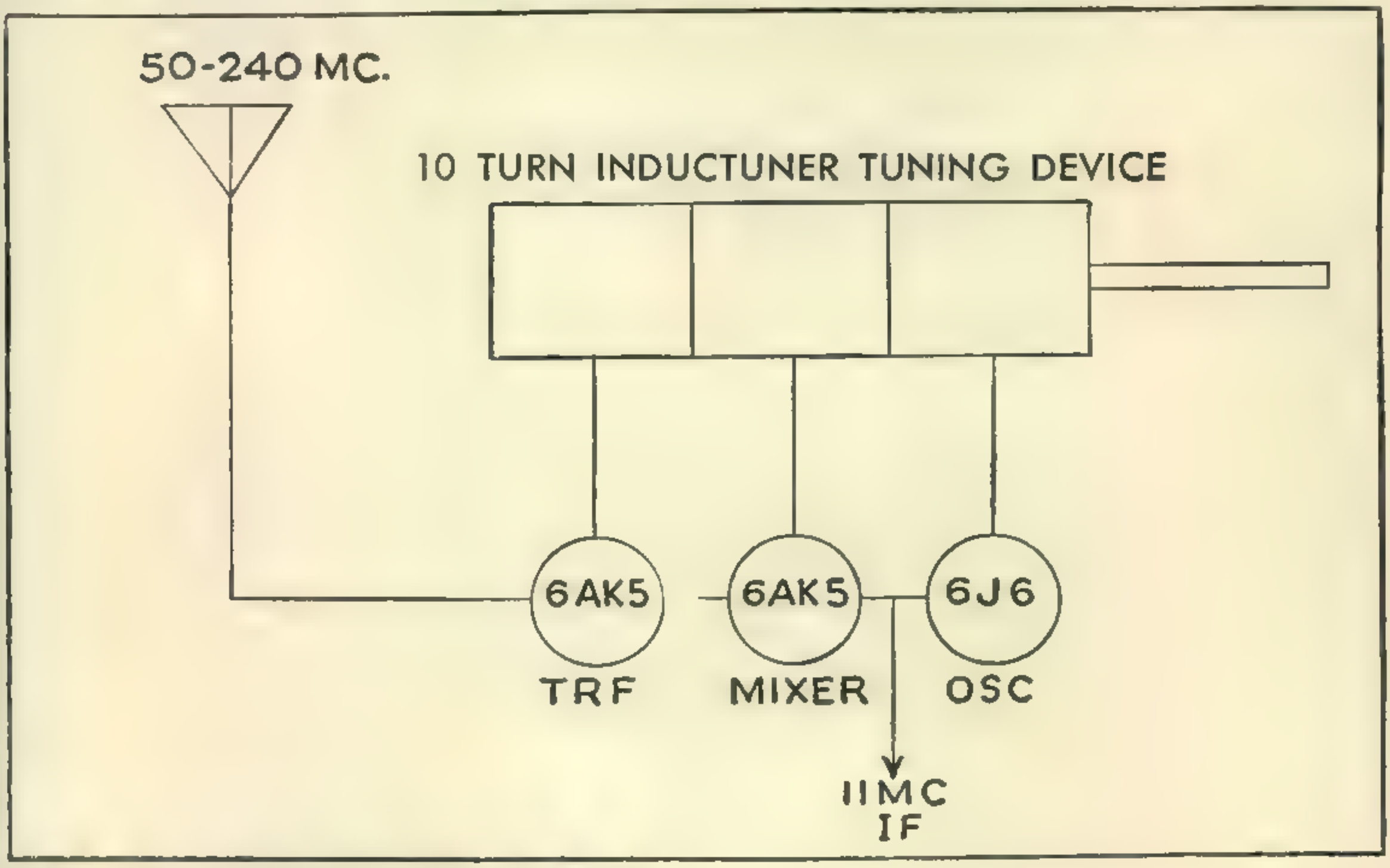
MALLORY HAM BULLETIN

Once circuit constants of this Converter had been worked out, little difficulty was experienced in getting it to perform in a highly satisfactory manner. "Listening" tests conducted with it in conjunction with a conventional communications receiver tuned to 11 Mc as its IF, more than surpassed predicted performance. Oscillator stability was excellent after only a 10-minute warm-up, tuning was accomplished without a trace of backlash or "pulling" and the sensitivity of the unit appeared to be unusually satisfactory throughout its very wide tuning range. Six meter stations from the East Coast were logged as well as 100 Mc FM stations from Chicago (about 175 miles) using a very poor indoor dipole antenna cut for 160 Mc operation!

(We have prepared constructional and circuit details of how to duplicate the Inductuner Converter. This information is free for the asking. Just write us at Box 1558, Indianapolis 6, Indiana, and mention Inductuner Converter. In the meantime, be sure to see the Inductuner at your Mallory distributor's.)

In addition to a VHF application, we have reason to believe that the Inductuner tuning device may also have a number of medium frequency applications of equal importance. It has just occurred to us that the coils and contacts of the Inductuner should be able to "take" at least 10 watts of RF power . . . this sounds like good dope for the construction of a ganged control VFO exciter. But more on this later.

You can rely on Mallory Precision manufacturing to supply you with the most dependable line of: resistors, ham band switches, push button switches, controls—rheostats—potentiometers—pads, tubular capacitors, transmitting capacitors, dry electrolytics, dry disc rectifiers, vibrators and vibrator power supplies, practically every component you need to keep your rig in A-1 condition.



P. R. MALLORY & CO., Inc.
INDIANAPOLIS 6 INDIANA

This can be your complete ham shack

YOU will have an outstanding station with a Collins 75A-1 receiver and a Collins 32V-1 transmitter. Both cover the 80, 40, 20, 15, 11 and 10 meter bands. Both, with their individual power supplies, are housed in cabinets of the same size and styling, and the speaker cabinet is styled to match.

The compact, bandswitching, gang-tuned 32V-1 is conservatively rated at 150 watts input on cw, 120 watts on phone. It employs the 70E-8 PTO as the VFO. The dial calibration is very accurate, and the frequency stability compares favorably with most crystals used by amateurs. The single ended pi output network will load the transmitter into a wide variety of antennas. It has two tuning controls, one for tuning the final, the other for loading the antenna. The net price of the 32V-1 to amateurs, complete with tubes and instruction book (exclusive of state tax), F.O.B. Cedar Rapids, Iowa, is $475.00.

The 75A-1 receiver utilizes a double conversion circuit (triple detection) to give you 50 db image rejection on all bands. The 6AK5 r-f stage makes possible a threshold sensitivity far better than can be realized in normal installations. This threshold sensitivity corresponds to a receiver noise factor of from 5 to 10 db above a perfect receiver of the same bandwidth. Crystal filter controls provide a bandwidth variation in 4 steps from 4 kc to 200 cycles at 2X down. Accuracy and stability are very high. The net price of the 75A-1 to amateurs, complete with tubes, speaker and cabinet assembly, and instruction book (exclusive of state tax but including excise tax), F.O.B. Cedar Rapids, Iowa, is $375.00.

All Collins amateur equipment may be bought direct from the factory, and all except the 70E-8 on the following terms:

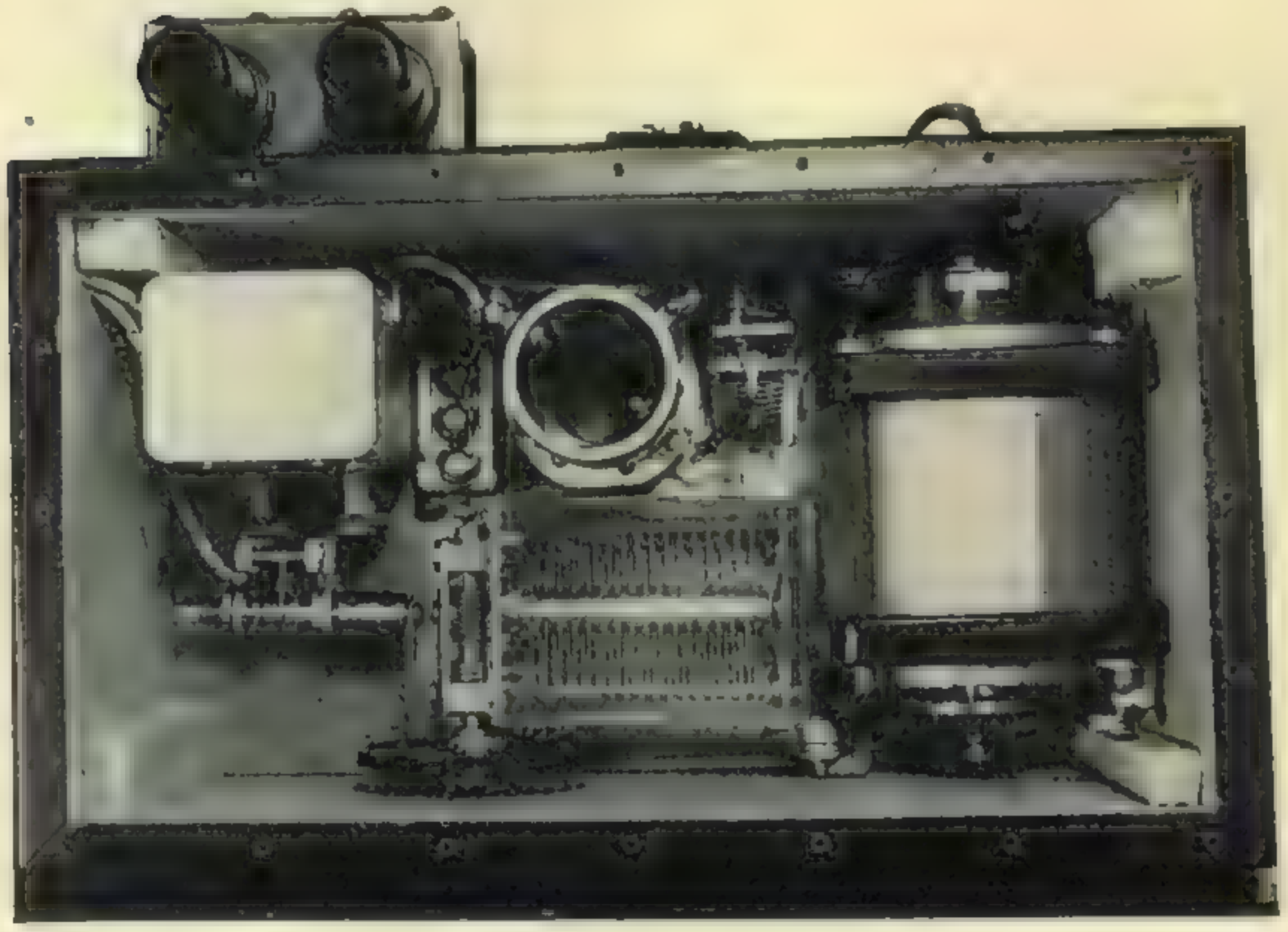
20% cash with order, the balance plus 5% carrying charge to be divided into twelve equal monthly installments.

FOR BEST RESULTS IN AMATEUR RADIO, IT'S . . . COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 West 42nd Street, New York 18, New York

458 South Spring Street, Los Angeles 13, California



Looking down into the insulated compartment of the v.f.o. The driving Selsyn is at the right.

A Selsyn Driven V. F. O.

ROBERT V. McGRAW, W2LYH*

Chirpless, clickless break-in keying coupled with simplified circuit and transmitter design are really obtained with this remote control variable frequency oscillator.

WHILE IT IS UNDOUBTLDLY possible to obtain a satisfactory c-w signal when keying a self-controlled oscillator, it must be admitted that optimum signal quality with conventional circuits can be approached only by allowing the oscillator stage to run continuously, and keying one of the following stages in the transmitter. The frequency of any oscillator will shift as the plate voltage is varied from zero to maximum. It therefore follows that the note obtained from a keyed oscillator must be a compromise between chirps and clicks.

Keying a subsequent stage in the transmitter allows proper shaping of the keyed wave without fear of causing a chirpy note. Further, the frequency stability of the oscillator will be greatly improved if it is allowed to run continuously, both during keying and standby periods. Actually, the only possible excuse for keying an oscillator is to allow break-in operation on the transmitting frequency. Since this may be classified as a desirable feature, we have spent considerable time and effort in achieving this particular advantage. A heterodyne type of v.f.o., in which the output of a crystal oscillator was mixed with that of a low-frequency variable oscillator, was constructed. The mixer stage was keyed and both oscillators were allowed to run continuously. The system gave a practically perfect signal, but had the very distinct disadvantage of emitting a few weak spurious frequencies throughout the spectrum. Because of this, the system was finally and reluctantly abandoned.

The tests and work with the heterodyne v.f.o. did show that it was possible to shield one of the oscillators sufficiently to prevent reception of the note on the transmitting frequency even though the oscillator was running. The degree of shielding had not been particularly elaborate, but the results obtained seemed to indicate that the time and effort devoted to attempting to get a good note from a keyed oscillator might be employed to better advantage in shielding, thus removing entirely the necessity of keying this stage.

The v.f.o. described is our answer to this problem. In early tests it was possible for unwanted r.f. to escape during the key-up periods through the keyed stage; both through stray capacity in the wiring and through the tube itself. This effect has been greatly minimized by the simple expedient of taking the output of the keyed stage through a Faraday shield to the buffer stage pickup coil. With the key up, there will be very little r-f current flowing in the keyed stage plate tank, consequently very little energy will be coupled through to the buffer stage, since the screen preserves the continuity of the electrostatic shielding of the oscillator compartment.

The Circuit

The oscillator circuit is the familiar tuned-plate tuned-grid tickler type using a 6J5 triode. The complete schematic of the v.f.o. may be seen in

* *308 East Ave., Riverhead, L. I., N. Y.*

Fig. 1. The oscillator frequency range is 1750 to 2000 kc. The tank circuit is only moderately high-C, but its Q is kept high and the effects of tube variations are reduced by tapping the plate of the tube down from the hot end of the coil. The oscillator runs at a low power level drawing about 3 ma at 150 volts. The feedback is only enough to insure reliable and stable oscillation. The warm-up drift is negligible after the first few minutes of operation.

A 6AC7 as a Class A isolating stage follows the oscillator. A second 6AC7 is lightly coupled to the isolation stage and serves as a doubler which feeds a 6F6 untuned buffer amplifier, which in turn drives a 6F6 output amplifier. The nominal output is on 80 meters, although 40-meter output may be obtained by doubling in the 6F6 output stage.

The doubler stage and both 6F6s are keyed in their cathode circuits. A VR150 is used to regulate plate and screen voltages on the first three stages. All tubes are operated at a low power level, the object being to obtain quality rather than quantity of output. The r-f output of the v.f.o. is about two watts, sufficient to drive a 6L6, 807, or similar tube. Ordinarily the output stage will not need to be

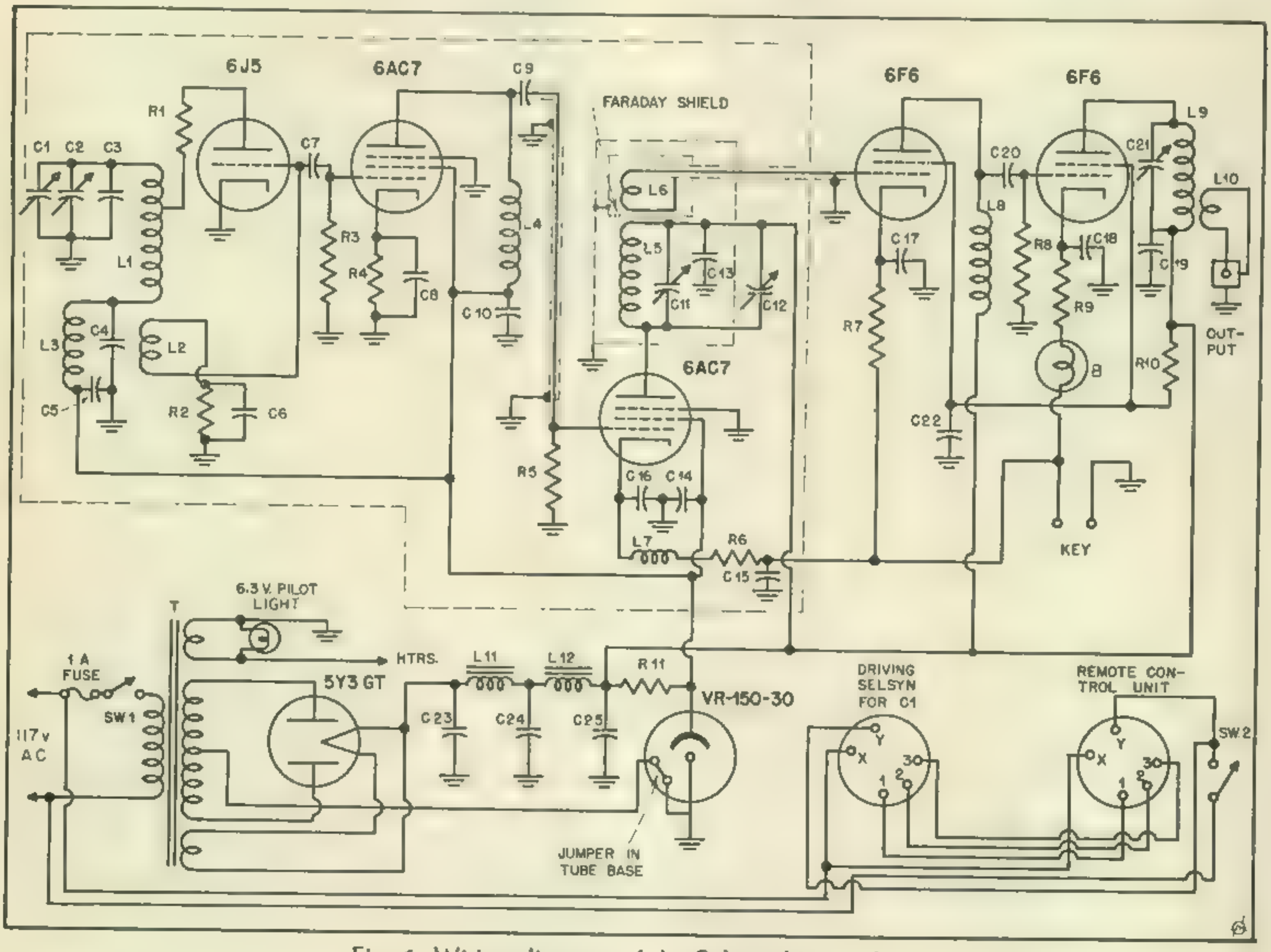


Fig. 1. Wiring diagram of the Selsyn driven v.f.o.

C1—180 $\mu\mu$f, variable.
C2, C11—47 $\mu\mu$f, air padders.
C3—250 $\mu\mu$f, zero temperature coefficient, ceramic.
C4—0.3 μf, bathtub.
C5, C10—0.1 μf, 400 v., paper tubular.
C6—180 $\mu\mu$f, silver button, mica.
C7, C9—20 $\mu\mu$f, ceramic.
C8, C13, C14, C15, C16, C22—.01 μf, 400 v., paper tubular.
C12 –15 $\mu\mu$f, variable.
C17, C18, C19—3 x 0.1 μf, 400 v., bathtub.
C20—.001 μf, 400 v., paper tubular.
C21—100 $\mu\mu$f, midget variable.
C23—4 μf, 650 v., paper.
C24, C25—Dual 8 μf, 450 v., electrolytic.

R1—200 ohms, ½ watt.
R2—56,000 ohms, ½ watt.
R3—0.47 meg., ½ watt.
R4—1500 ohms, 1 watt.
R5, R8—0.1 meg., ½ watt.
R6—1000 ohms, ½ watt.
R7—1200 ohms, ½ watt.
R9—390 ohms, 1 watt.
R10—15,000 ohms, 2 watts.
R11—7,200 ohms, 10 watts.
B—60-ma pilot lamp.
T—Power transformer, 350 volts each side center, Stancor P-6013 (or equivalent).
L1—44 turns No. 22 enameled, closewound, tapped at 27 turns from cold end
L2—18 turns No. 24 enameled, closewound, spaced ⅛ inch from cold end of L1. (L1 and L2 wound on National type XR-13 ceramic form, 1 ¾ inch diameter).
L3—8-mh r-f choke.
L4, L7, L8—2.5-mh r-f chokes.
L5—44 turns No. 24 enameled, closewound on National type XR-1 bakelite form, 1 inch diameter.
L6—20 turns No. 24 enameled, scramble-wound, 1 inch diameter.
L9—33 turns No. 24 enameled, closewound on Amphenol ¾ inch form.
L10—4 turns hookup wire wound around cold end of L9.
L11, L12—Filter chokes, Stancor C-1001 (or equivalent).

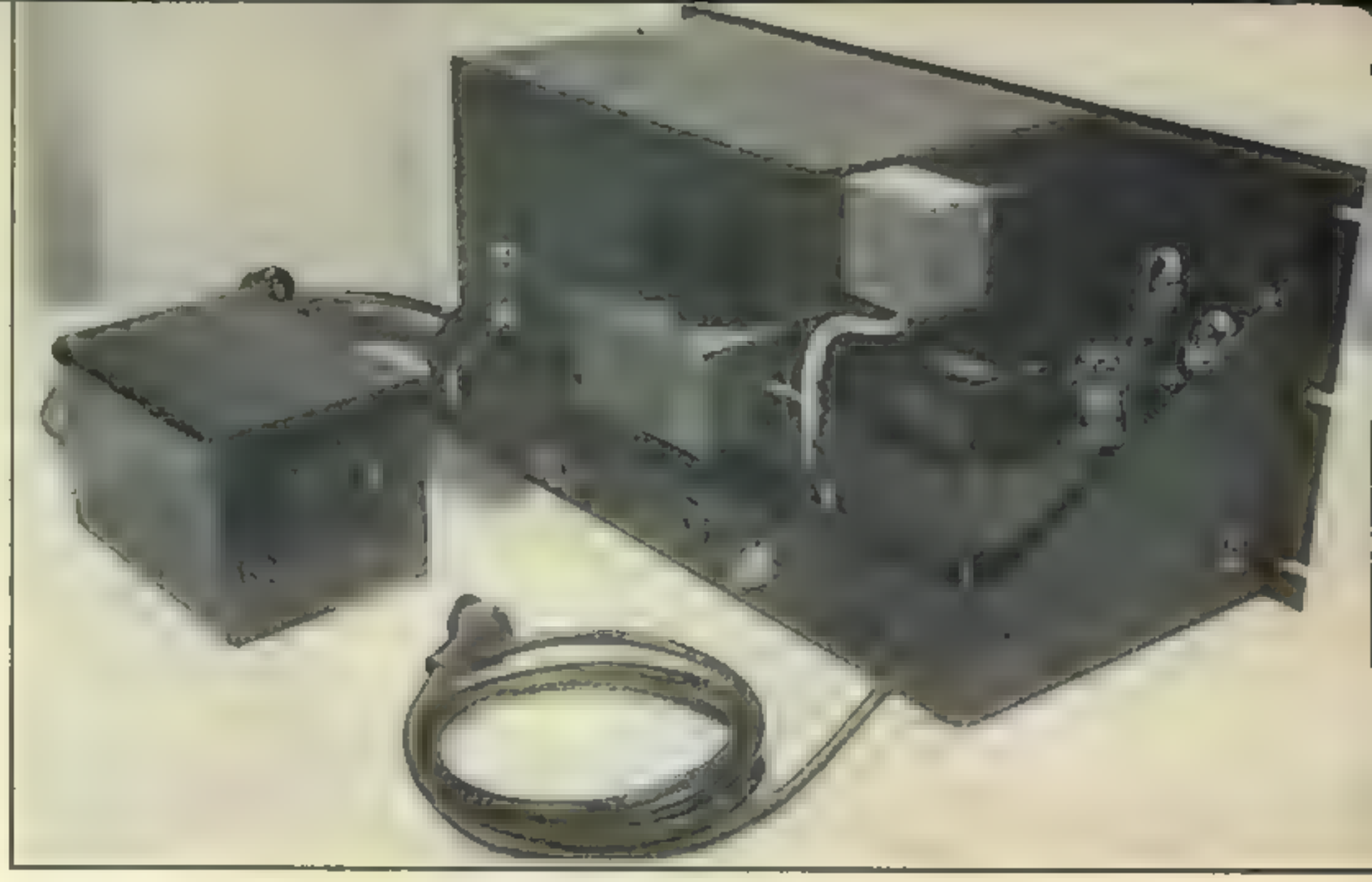


Fig. 4. The complete Selsyn driven v.f.o. The Selsyn control box to be used at the operating position is shown in the left center. No calibration is used with this v.f.o. A paired Selsyn inside the insulated compartment drives the oscillator tuning condenser. The tubes and all heat producing parts are mounted outside of the insulated compartment.

retuned over most of the 80-meter band, and not at all when operating on the higher frequency bands. Keying should be through an external key click filter of the usual series-inductance and parallel-capacity variety or through a vacuum-tube keyer. A simple filter which has proven to be fairly success-

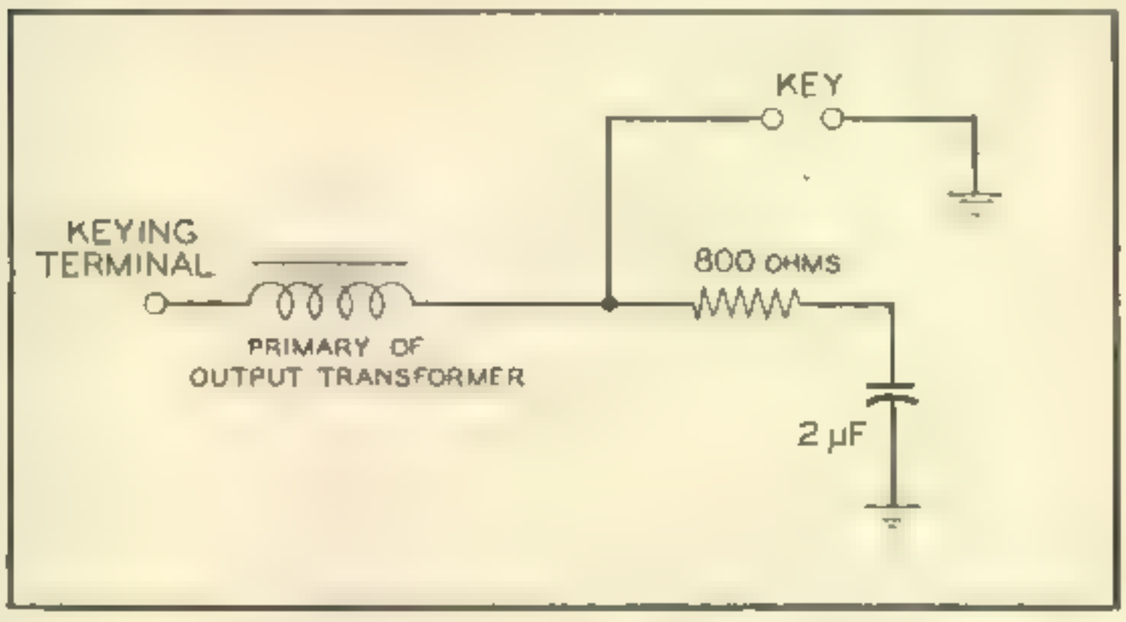


Fig. 2. A simple key click filter useful in cleaning up the last trace of click in the signal.

ful is shown in *Fig. 2.* A more elaborate vacuum-tube keyer is shown in *Fig. 3.* This keyer has proved to be particularly effective for break-in operation, allowing clickless reception on the transmitting frequency.

The electrical schematic, *Fig. 1,* shows all the oscillator, isolating stage and doubler components which are to be shielded encompassed in the dashed outline. In our v.f.o. this part of the circuit is inside of a standard 6 x 7 x 12-inch metal box, or in subsidiary small chasses mounted on the sides. The box is lined with Celotex and is mounted on rubber feet attached to the main chassis. This method of construction virtually eliminates frequency modulation of the generated signal due to vibration, while at the same time it further insulates the oscillator components from the heat of the power transformer and rectifier tube. The oscillator tube and the first 6AC7 used in the isolating stage are mounted on the rear of the unit in a homemade copper box. The 6AC7 doubler is mounted on another copper box on the side of the sealed housing nearest the 6F6 amplifiers. The construction of these boxes may be clearly seen in *Fig. 4.* Strips of brass are soldered to the inside edges, and drilled and tapped for the cover screws. All resistors, condensers, chokes, etc., associated with the immediate circuits of these tubes are contained within the copper boxes.

The 5Y3GT rectifier and the VR150 voltage regulator can be seen alongside the power transformer in *Fig. 4.* All wiring for the rectifier and the last two stages of the v.f.o. is beneath the main chassis and may be seen in *Fig. 5.* The 117-volt a-c fuse, output coax fitting, control unit socket and keying terminals are arranged along the rear skirt of the chassis. Also prominently visible in *Fig. 5* is the output tank of the 6F6 power amplifier. A four-turn link is used to couple the v.f.o. to the transmitter. The coil consists of 33 turns of #24 enameled wire, closewound on an Amphenol ¾-inch polystyrene form. The circuit is tuned from the front panel.

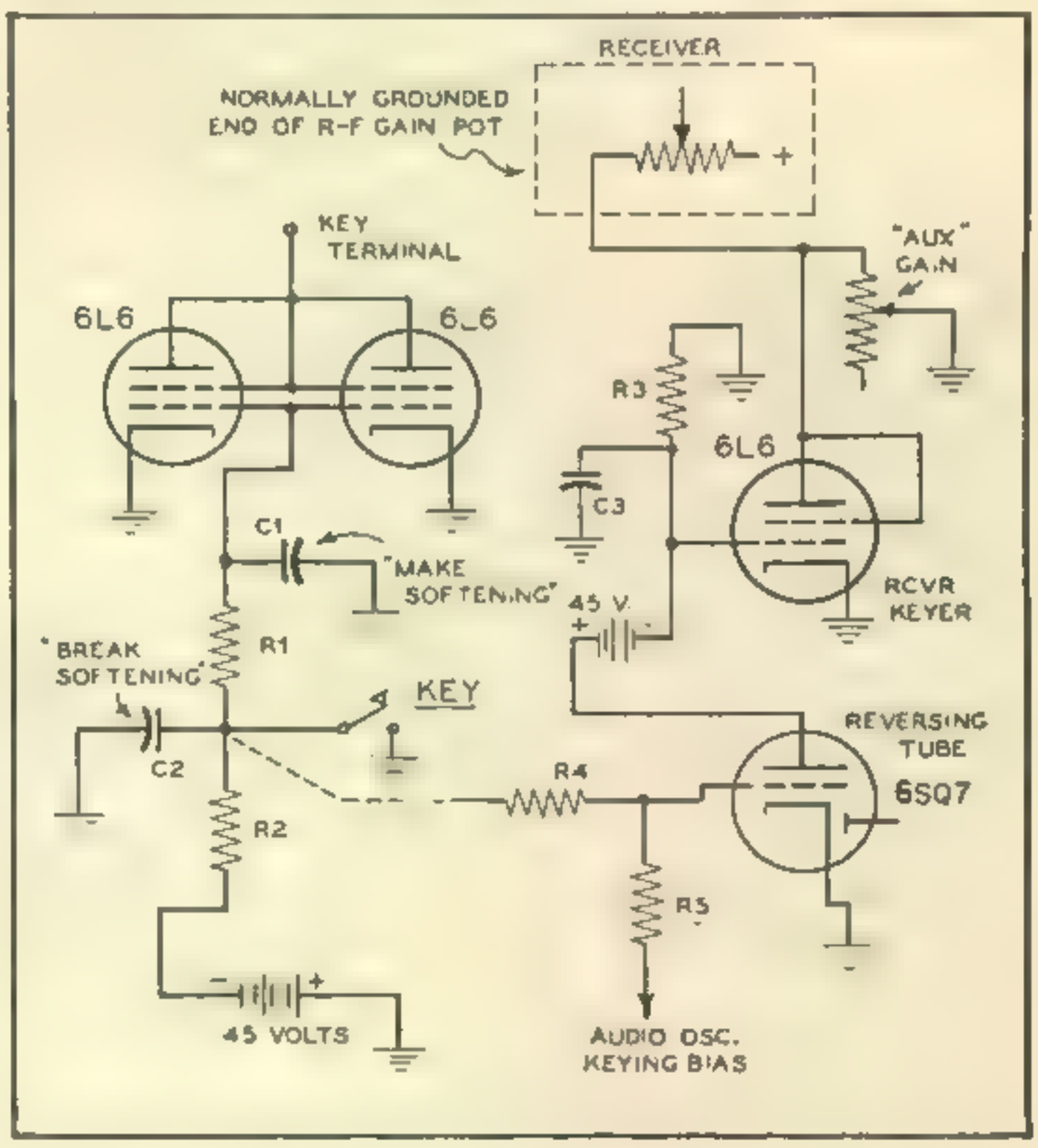


Fig. 3. The vacuum tube keyer used by the author. This system allows break-in operation plus receiver protection and sidetone on your own transmitting frequency.

R1, R4, R5 — 470,000 ohms, ½ watt, carbon.
R2 — 1.0 meg., ½ watt, carbon.
R3 — 820,000 ohms, ½ watt, carbon.
C1 — .004 μf, mica.
C2 — .02 μf, paper.
C3 — .01 μf, paper.

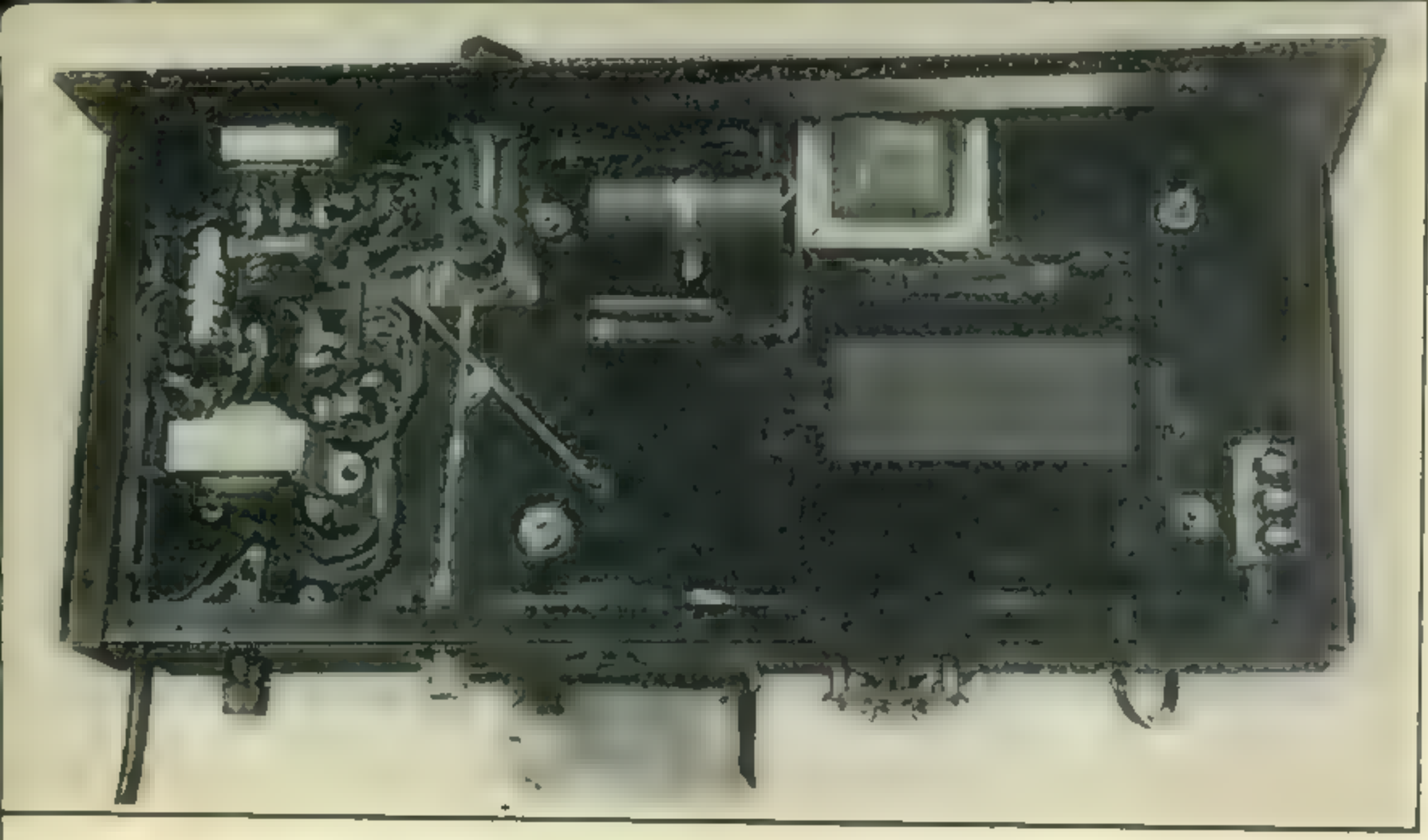


Fig. 5. Bottom view of the v.f.o.

The Faraday Shield

An important part of the isolation effect in the v.f.o. is the Faraday shield between the plate tank circuit of the 6AC7 doubler stage and the 6F6 buffer amplifier. The purpose of this shield is to prevent undesired electrostatic coupling to the buffer, while not interfering with normal "key down" magnetic coupling. The doubler tank coil and trimmer condenser are mounted on a bracket bolted to the base plate and covered by a National shield can. The buffer grid pickup coil is placed inside a small copper shield can which has had the top section cut out. The Faraday screen is placed across this opening so that the pickup coil is coupled to the plate tank coil of the doubler through the screen. The pickup coil output lead is led under the main chassis to the buffer stage through a shielded lead.

The Faraday shield can be constructed quite easily by close winding a sufficient length of #38 DCC or similar wire around a cardboard form. The insulation of the wire should then be removed from about a quarter-inch strip of the winding with fine sandpaper. The strip is then entirely soldered together so that all the wires are joined at this point. Then several coats of coil dope are applied to the winding. After this has dried the winding is cut alongside of the solder connection. The winding is then pressed out flat and trimmed down to the size necessary for the shield box. No connection is made to the free ends of the wire. The soldered connection is grounded directly to the shield can. *Fig. 6* illustrates the construction of the Faraday shield.

Further Construction Notes

The oscillator inductance should be tightly wound on a ceramic form. These have a much lower coefficient of expansion than the bakelite type commonly employed. The oscillator tuning condenser should be double spaced, accurately centered, and of good mechanical construction. A worm gear drive mechanism will be useful as explained later on. Like the coil and other components, the condenser is solidly bolted to the heavy metal base plate, whose thermal inertia serves further to "iron out" temperature variations. Consequently, the temperature inside of the oscillator compartment can vary only at an extremely slow rate. The original idea was to use a thermostat and heater arrangement to control the temperature, but this was later deemed unnecessary. Actually, if a simple heater-thermostat circuit is located external to the insulated box, the thermal variation within the box will be less than if no heater-thermostat circuit were used.

The small trimming condenser, *C12*, across the plate coil of the 6AC7 doubler stage is ganged to the oscillator tuning condenser. This mechanical arrangement may be accomplished in a number of ways. The simplest method we have found is to directly couple the two condenser shafts and vary the doubler inductance until the output is uniform across the entire 80-meter band. This is not as difficult as it may sound. The top view photograph shows the mechanical arrangement we are using. Also visible in this particular illustration is the shield can for the doubler output stage in the upper left-hand corner and the oscillator tuning condenser with its dustproof case in the lower center. At the right-hand side of the compartment is the Selsyn driving motor used for tuning the oscillator.

The Selsyn Tuning Controls

The most interesting feature of this v.f.o. is the use of Selsyn motor control for tuning. It is immediately obvious that this has a number of advantages. The v.f.o., itself, may be located anywhere in the shack and tuned remotely from the operating position, reducing the problem of running

(*Continued on page 91*)

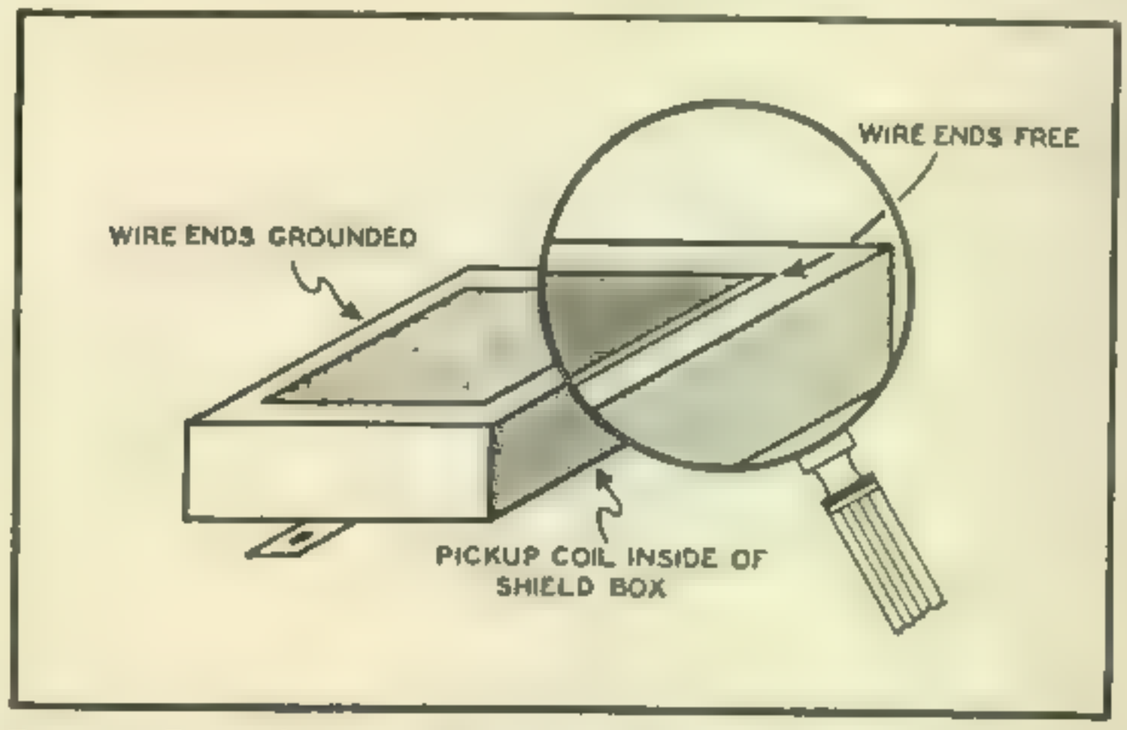


Fig. 6. Detail of the Faraday shield mounting. The pickup coil to the buffer is placed inside the box and is coupled to the doubler tank through the Faraday shield. The method of making the shield is described in the text.

Bet My Money on a Bobtail Beam

WOODROW SMITH, W6BCX*

Let's revive 40-meter DX. A good antenna is a big help. Here is a simple one that really does a job.

WHAT WITH THE HIGH average MUF the last couple of years, most of the DX work has been confined to the 10 and 20-meter bands. And the 40-meter band (except during the DX contest) has more or less fallen into the discard for such work. A listen on 40 will show that most of the current activity on this band is confined to medium haul traffic handling and rag-chewing.

In view of the fact that 40 *can* be used for real DX work a good portion of the time even during a year of high sunspot activity and high average MUF, the current lack of popularity of this band for DX work probably can be explained by the fact that a "DX" antenna is much more readily constructed for 20 and 10 than for 40 meters. A 40-meter three-element rotary array a wavelength up in the air undoubtedly would produce wonderful results on DX, but physically such an array is not practical for amateur work. On 20 and 10 such arrays are commonplace.

A listen on one of the rhombic arrays of W6GRL a short time ago convinced the writer that there is plenty of "stuff" to be worked with ease nowadays on 40, *if* one has a good "DX" antenna. Even with something short of a well designed rhombus there is a lot of stuff to be worked if one has a little patience and is willing to grub for it. However, the better the antenna, the easier it is to work. This is true of any band, of course, but it is especially true of 40. Oftentimes the signal is "getting there" or "coming through" on 40, but is just a little too weak, and hides down in the background noise.

It is the writer's belief that we had better start taking full advantage of the DX potentialities of 40, or otherwise at the next world conference our adversaries undoubtedly will uncork the argument that the U. S. amateurs don't use 40 meters for DX anyway, and that all of the boys on 40 could just as well move up into some of the holes on 80.

And while on the subject of our propaganda pushing protagonists, the best way to make use of the shared portion of the band after the fateful day (or before then if they should jump the gun) is to run as much legal power as one can afford and feed it into the best array one is in a position to put up.

7-Mc Propagation, a Recap

Forty shows up to best advantage for DX when the wave path is all or nearly all in darkness. Under these conditions the 7-mc absorption on "undisturbed" days is not much greater than when a frequency near the MUF is used, even though the MUF may be as high as 18 or 20 mc. This of course does not apply when a substantial part of the path between the two 1250 mile "control points" is not in darkness. In the latter case there will be a rapid increase in absorption as the frequency is lowered below the MUF. However, this is a less serious limitation than is imposed by the vagaries of the MUF with respect to the currently popular 28-mc band, the latter ordinarily being useful for DX only when there is daylight between the 1250 mile control points (even during a period of high sunspot activity).

Strictly speaking, "daylight" at a control point must be considered as occurring from roughly 1 to 3 hours after sunrise until roughly zero to 3 hours after sunset, because of the variable "lag" in the ionization density of the F_2 layer with respect to the intensity of the sun's rays. Also, the effect of the presence of the E layer must be considered. But

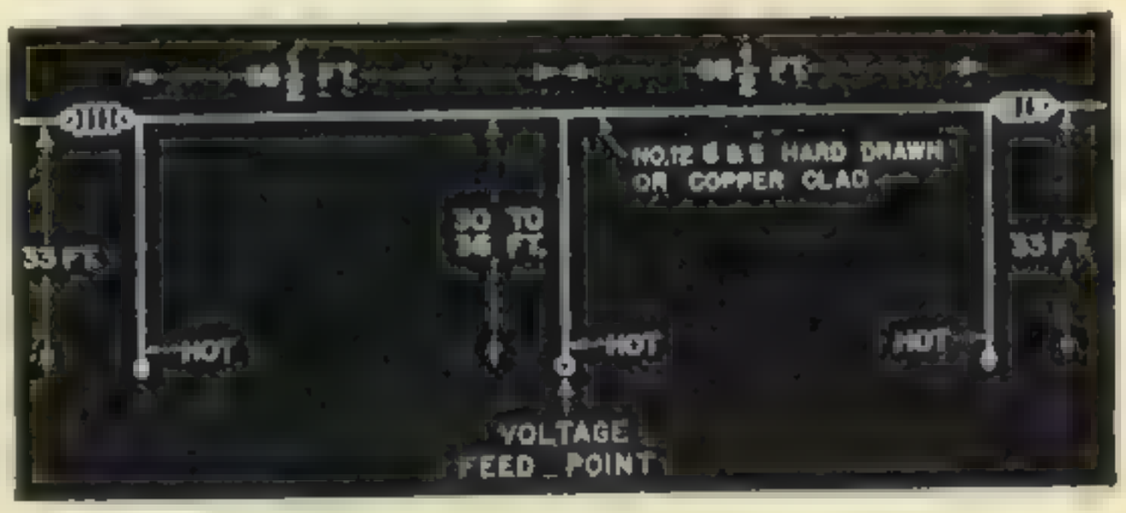


Fig. 1. Schematic of the "Bobtail" bi-directional broadside curtain for the 7-mc band. In spite of its simplicity, it really does a job on DX. For 75-meter phone, just multiply the dimensions by 1.82 (provided you have the room and can get a couple of 70-ft. sticks).

the foregoing gives a good idea of the general considerations involved.

The really important thing to remember in working DX on 40, assuming that the receiver has sufficient selectivity to pull the DX out from under the skirts of the omnipresent domestic "bone crushers," is that *the antenna must be a low angle job.* Most of the radiation and response should be confined to angles below 15 or 20 degrees.

While a higher angle can be used more successfully on 40 than on 20 and 10, the *optimum* angle for distances beyond 2500 miles generally is below 15 degrees, and at times may be as low as 5 degrees. This statement must be qualified in order to be strictly accurate, because when the atmospheric noise level is high as a result of static originating at great distances (usually the tropics), a somewhat higher wave angle may be just as effective or even

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more so. This is explained by the fact that under certain conditions a receiving antenna which has poor response at very low angles will discriminate strongly against such static. And if the receiving antenna has poor response at very low angles, the most effective angle of radiation at the other end of

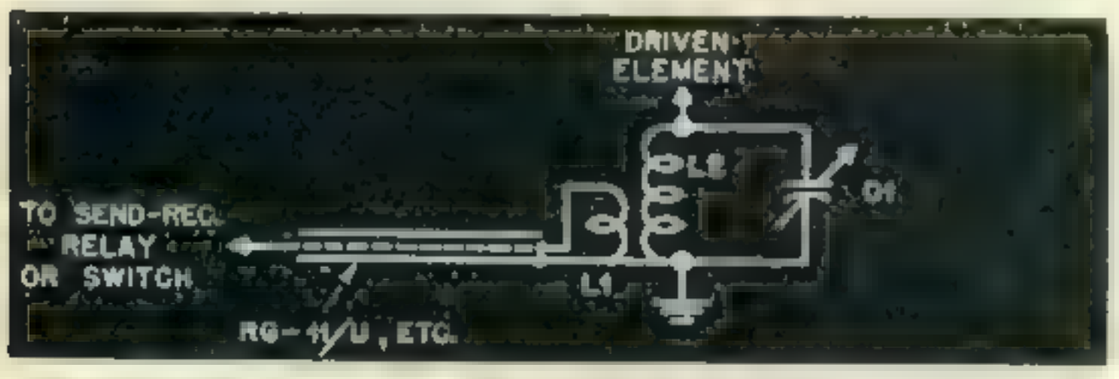


Fig. 2. Recommended feed method for the Bobtail curtain. This arrangement discriminates strongly against harmonics and keeps the "hot" lower end of the driven element away from the transmitter. The antenna tank circuit is described in the text.

the circuit will be somewhat higher than would be the case for identical antennas at both ends of the circuit.

But considering day in and day out performance, a "low angle" antenna at both ends of the circuit will provide the best signal over a DX path.

Remember the "30—30"?

This was brought home to the writer quite forcefully back in 1928, when a "30 up and 30 out" or "30–30" was taken down and a horizontal Zepp about 40 feet off the ground substituted. For the benefit of those comparatively new to the fold, a "30 up and 30 out" consisted of a 30 foot (or slightly longer) vertical radiator worked against a 30 foot (or slightly shorter) horizontal counterpoise, the latter usually suspended only a few feet off the ground. The vertical element often was terminated with a copper toilet ball, which was supposed by the more superstitious to possess some magical DX raising powers. The antenna resembled a directly-fed Brown ground plane antenna, placed low to the ground, but with only one lone radial (see *Fig. 3*).

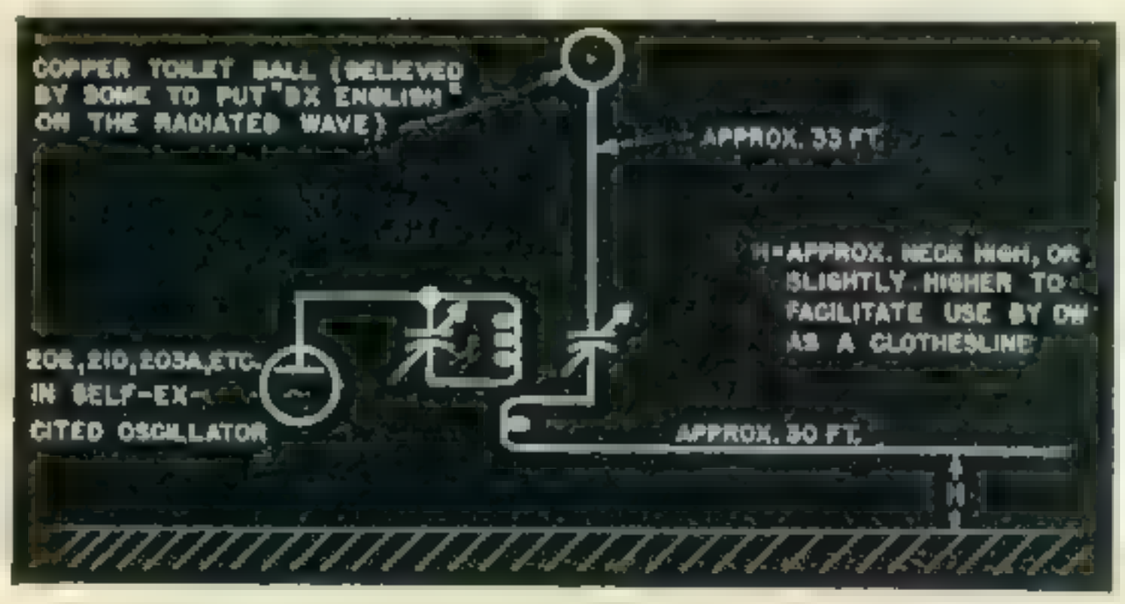


Fig. 3. Newcomers are cautioned not to snicker at this rather unpretentious 40-meter antenna. Widely popular in an era fondly referred to by old-timers as the "good old days," it was responsible for numerous 40-meter W.A.C. certificates. The "Bobtail" of Fig. 1 is about two "S" points better.

This one-leg radial system undoubtedly had an appreciable effect upon the horizontal pattern, but the antenna had the reputation of being a pretty good DX performer in all directions, the horizontal directivity not being sufficient to prevent working "stuff" over the entire 360 degrees. In fact, it was fairly common to work the world with such an antenna on 40, using nothing larger than a 210 or a venerable "five watter" running with from 25 to 50 watts input in a self-excited oscillator.

The writer's version of this old time favorite antenna (complete with toilet ball; he wasn't taking any chances) did a pretty good job of snagging some fairly good DX on 40 from a location that was nothing to brag about. In fact, the results were good enough that the reason for switching to a horizontal Zepp is beyond memory. But anyhow, after the Zepp was put up, DX was called unsuccessfully for nearly a month. Finally an Aussie (ordinarily duck soup on the 30–30) was raised and a very unflattering report received.

Yes, the Zepp was tuned up properly, because daylight reports from stations out to about 250 miles were from two to five 1928 "R" points (or 1948 "S" points) better than with the 30–30. Also, the results with the horizontal Zepp on DX were typical of those experienced by other amateurs not blessed with an elevated location or a pair of 70 or 80-foot sticks.

Briefly, it boils down to this: For the most *consistent* DX work on 40 meters, a "low angle" antenna is required. And the only way to achieve a low angle with modest pole heights and ground space is to use vertical polarization. A further increase in gain can be realized by utilizing an array of vertical elements, in order to provide some horizontal directivity.

The "Bobtail" Curtain

A highly effective array for 40-meter DX work, one which requires only a moderate amount of ground space and two poles of modest height, is illustrated in *Fig. 1*. Excellent results will be obtained with pole heights as low as 40 feet, though a few more feet of height is desirable in order to protect against accidental contact with the "hot" lower ends of the two outside elements. The ground space required for this simple array is approximately the same as for a horizontal half-wave radiator on 80, and while prohibitive for the amateur confined to a small city lot, should offer no problem to the amateur who has access to one or more adjacent lots or else lives in the suburbs or in the country.

The effective elements, so far as radiation and response are concerned, are the three vertical quarter-wave elements. Therefore the line of the bidirectional beam is at *right angles* to the flat top. The current relationships in the flat top sections are such that the radiation and response are pretty well cancelled. The cancellation in the flat top is not perfect, however, and while the radiation and response are not great enough to produce a significant reduction in gain, they do deteriorate the discrimination slightly. However, this is not serious, and is a cheap price to pay for such simplicity of construction.

The current in the center radiating element is considerably greater than that carried by each of

the two outside radiating elements. This reduces the gain and directivity slightly from that which would be obtained with all three vertical elements fed equal currents. However, the reduction is very slight, and the "tapered" current distribution helps minimize radiation and response along the direction of the flat top.

Performance

The beam width at the half power points is approximately 60 degrees, and the *directivity* power gain over 1 element is approximately 5 db. Thus the beam width is great enough to cover a lot of DX territory (an important item when a single, fixed array is employed), yet the power gain due to the horizontal directivity is quite worth while, being equivalent to an increase in power of nearly four times. In connection with the latter, it should be noted that the practical DX signal gain will be substantially *greater* than 5 db over a conventional ground plane antenna utilizing the same pole height of 40 to 45 feet, because in the Bobtail curtain the current loop in each radiating element occurs at the *top* of the element, rather than at the bottom. This increases the vertical directivity somewhat over that obtained with the ground plane job. There also are other advantages to having the current loop at the top rather than at the bottom of the vertical elements, but suffice it to say the net result is to make the practical DX signal gain over a ground plane antenna still more pronounced. And as mentioned before a 40-meter ground plane vertical (which may be considered a more highly engineered, symmetrical version of the old reliable 30–30) is nothing to be sneezed at when it comes to performance on DX.

Three or four feet of sag can be tolerated at the center of the flat top. This allows the lower end of the outside elements to be elevated at least 8 feet above ground (thus precluding the likelihood of accidental contact) while still permitting some useful leeway in the location of the feed point (the lower end of the center section). The leeway is made greater by the fact that the length of the center section is not especially critical, and by the fact that it need not be exactly vertical. Thus, if the transmitter or at least part of the operating room can be located approximately under the center of the flat top, feeding the array should offer no problem.

The impedance is high at the lower end of each of the three elements. Therefore good insulation should be employed at these points in order to avoid losses, and in the case of high power to avoid flashover. This is especially true of the center element, where it is brought into the operating room. Only a good quality lead-in insulator should be employed, and if the power is high the leakage path should be at least three inches.

The dimensions of the array are not extremely critical, and good results usually will be obtained over the 7000–7300 kc. range with the dimensions designated in *Fig. 1.* However, variations in the shunt capacity of the two outside lower insulators and the unpredictable effect of nearby surrounding wires and buildings may make it desirable to optimize the dimensions with the aid of a field strength meter. The latter should be placed along the line of

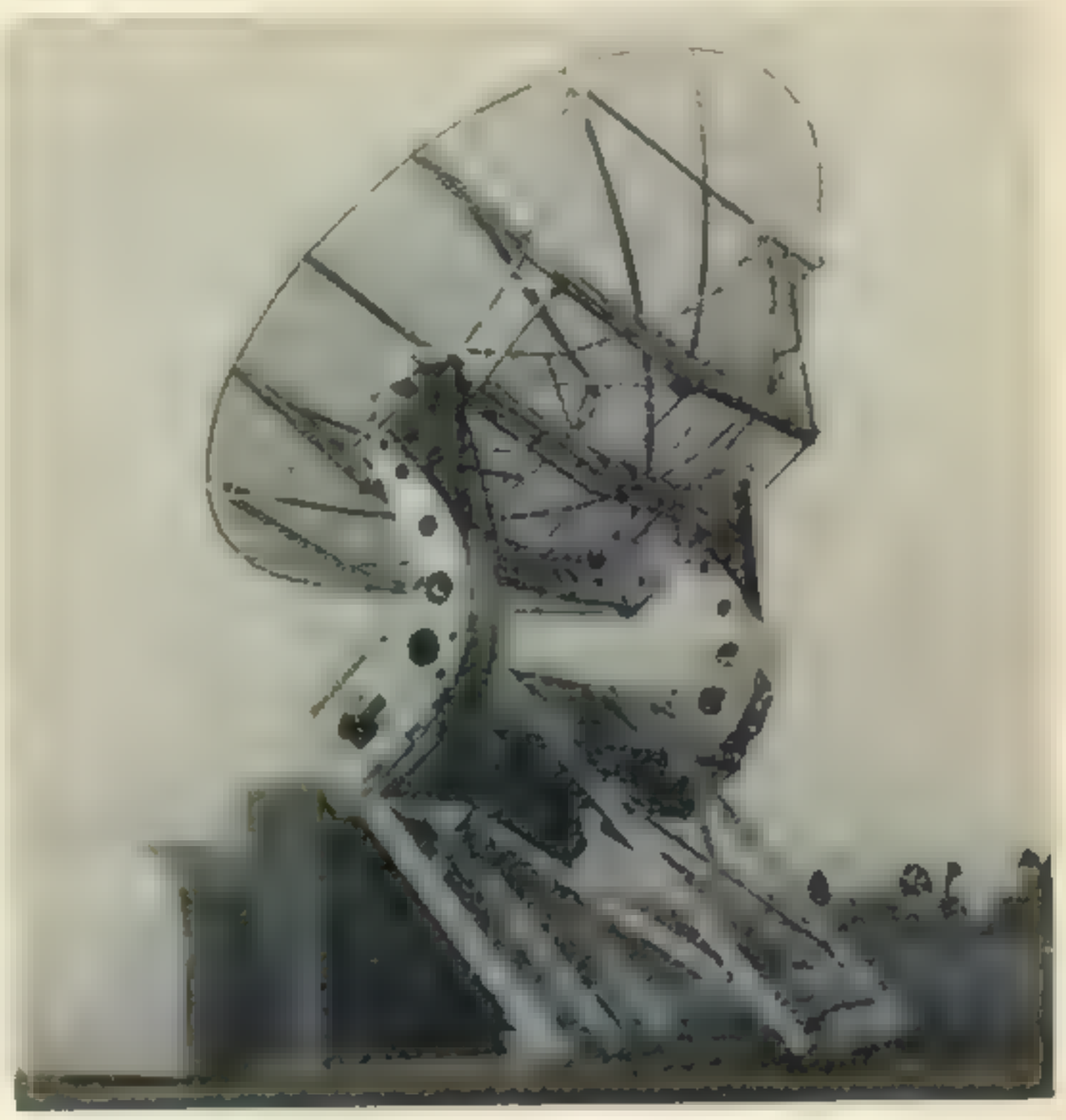
(Continued on page 92)

Solar Static Investigation

The limiting factor in v-h-f reception can be the background hiss of the receiver. In the daytime a basic component of this hiss is solar static. With the better design of receivers the problem of solar noise becomes increasingly important. To study the intensity variations of the frequency range, a new project has been announced by the National Bureau of Standards propagation laboratory.

Two giant wartime radar antennas are being installed at the laboratory's station in Sterling, Va. These radar dishes will intercept the solar radiation and feed it into ultra-sensitive 480-megacycle receivers where intensity records will be made. The basket-type reflectors are about 25 feet in diameter and will automatically track with the sun throughout the daylight hours. At frequent intervals the reflector is oscillated about an axis through the ends of the supporting arms to correct for the north-south migration of the sun.

Solar static exists in two different forms. One is the type to be recorded particularly by the National Bureau of Standards, the other is the sudden bursts often associated with radio fadeouts. The latter ones sometimes pass through the radio spectrum in the form of a "puffing" sound or a "swish" lasting for one or two seconds. During great sunspot activity it is believed that the "swishes" occur so frequently that they overlap and give rise to the "grinder" which is a type of static well known to many of the old-timers. The combination of both of these forms of solar static will limit FM and television reception in the rural areas, not to mention 6 and 2-meter ground wave work in the daytime



The parabolic reflector from a German Giant Wurzburg being used to catch solar static.

2350-mc contact is established. W1ILS getting ready to check the wavelength. W1OTH talking into the mike with W1PAW directly to his left. W1NBL and jr. op at the right. Assorted BCLs in the background.

A Mile Per Milliwatt

DONALD F. BROWN, W1JSM*
And
LESLIE M. VANT, W1ILS**

One way to combine ham radio with picnic outings is to take to the microwaves. The equipment and experiences of this record-breaking New England group portend of things to come as the days get balmier.

On Sunday, October 5, 1947, W1ILS, W1OTH, and W1JSM set new records for long-range communication on the amateur ultra-high frequency bands. With less than 1/10 of a watt we established two-way contact on both 2350 and 3300 megacycles.[1] One portable station was taken to the crest of Mount Wachusett, near Princeton, Mass., and another portable station was set up on Mt. Greylock, near Adams, Mass. The airline distance between these two points is 66 miles.

Duplex operation was used and a 100% QSO was maintained for a period of about one-half hour on each band. The signals were S8 to S9 during these contacts except at moments when gusts of wind would swing the antennas, or uninhibited visitors stood in front of one of the beams.

The Problems and the Plans

During the war we had had ample opportunity to observe that under good conditions a few microwatts of power could be transmitted over great distances. Logically speaking, there appeared to be no reason why audible radio amateur communication could not be established over some of these ranges.

The method of approach to the problem was to develop or construct a simple transmitter for the 2300-mc band. From the war surplus available a 707-B reflex Klystron was chosen. This has since proven to be an admirable choice. The transmitting antenna was a surplus radar parabolic reflector designed for 3000-mc operation. The receivers did pose quite a problem, but crystal mixers, 707-B local oscillators and radar i-f strips were enough to lick this particular drawback. Considerable forethought went into the construction of the rigs and it was not until early in 1946 that the two units could be tried out in the workshop. A short test was made on Field Day, June 22 and 23, 1946, between Prospect Hill, Waltham, and a clearing in the valley below. This was over a distance of about 1.6 miles.

On August 3, 1946, we made one-way contact between a 100-foot tower at the El-Ray Radio Club in Waltham, Mass., and Waban Hill in Newton, Mass., a distance of 4.6 miles. These tests allowed us to iron out most of the bugs and the Spring and Summer of 1947 found us all ready to go. A preliminary test over a path of 14 miles resulted in 100% contacts. In this test a 20-db attenuator inserted in one receiving antenna circuit still permitted an S3 to S4 signal to be worked. This clearly indicated that we had potential results over much greater distances than we had previously anticipated.

Sunday, August 31, 1947, found us making two-way contact on 2300 mc from Mt. Wachusett to Great Blue Hill, a distance of about 45 miles. Duplex operation was accomplished for over two hours. Signals were S9 on both ends of the circuit. This test fired us to our best effort, so far.

Mt. Greylock and Mt. Wachusett were chosen both for their range and since we were able to obtain permission to use existing power facilities. W1ILS, W1OTH and Hugh Lyons made the trip to Mt. Greylock on October 4th and set up their equipment during the afternoon. Two meter contact was immediately established with W1JSM on Mt. Wachusett. The following day we made 2350-mc contact at 1203 EST. About one-half hour was spent in adjustments and tuning and at the end of

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**40 Paul Street, Watertown 72, Mass.

[1] Unbeknown to the authors, W6IFE and W6ET on the opposite side of the continent had chosen this very day to break the 3300-mc band record. They succeeded in working about 150 miles about two hours after W1OTH and W1JSM had worked 66 miles.—Ed.

the contact the signals were S9. Since equipment had been brought along for the 3300-mc band we attempted cross-band with Mt. Greylock on 3300 mc and Mt. Wachusett on 2350 mc. This involved considerable tuning, but with the experienced help of W1AQE and W1NXY the Mt. Greylock signal was located and tuned in. Somewhat similar trouble was encountered when W1JSM switched over to 3300 mc. Two-way contact was established on this band at 1600 EST with S8 signals. Contact was maintained for about one-half hour before the equipment was repacked for the trip back to Waltham.

The Transmitting System

The transmitter shown in the block diagram of *Fig. 1* consists of a 707-B Klystron oscillator, heater supply, two regulated power supplies and modulating equipment. One power supply is used for the cavity grids and has a regulated output of 300 volts d.c. obtained through two VR150 tubes in series. The positive side of this supply as well as the cavity grids are actually grounded. The negative side of the power supply goes to the cathode of the 707-B. Base pins 2 and 7 on the Klystron are the heaters, pin 3 goes to the cathode, and pin 6, the accelerating grid is grounded.

The second power supply is a half-wave affair using a 6X5 tube with the elements paralleled. 300 volts regulated d.c. are obtained across a 100,000-ohm potentiometer from two more VR150s. The arm of the potentiometer connects to the repeller of the 707-B. This varies the repeller voltage, negative with respect to the cathode, and sets the operating point of the tube. As the repeller potentiometer is adjusted oscillation will be indicated by a sharp increase in the cathode current or by a noticeable increase in the temperature of the cavity grid inside the tube. Oscillation may be found at more than one position of the repeller control. Maximum output is usually obtained at the highest voltage or "mode."

The frequency is varied principally by tuning the external cavity resonator. This may be similar to the one in the receiver or may be a war surplus model. Modulation is accomplished by inserting a one-megohm potentiometer in series with the repeller voltage lead. A 0.01-μf, 600-volt condenser in series with the arm of the potentiometer is connected to the secondary of an ordinary carbon microphone transformer. A carbon mike and a flashlight battery in series with the transformer primary provides more than enough modulation (FM). Caution! Do not touch the repeller lead or wiring as they may be as much as 600 volts above actual ground. The maximum output of the 707-B Klystron is in the vicinity of 100 milliwatts. The actual radiated power, however, is considerably less.

The receiving and transmitting antennas are similar. They are both "dish" type parabolas having an outside diameter of two feet. They are fed through a hole in the center of the dish with a section of rigid coax line. The radiating element is a simple dipole with a circular plate reflector spaced about 5/8" from and in front of the dipole. This prevents distortion of the radiated pattern. The radiated beam is in the shape of a circle about 20° wide. The polarity may be varied by shifting the plane of the dipole from horizontal to vertical. At 2300 mc, the length of the dipole is about 2 inches, while at 3300 mc it is 1 13/16 inches. These or very similar antennas are currently available on the surplus market.

The Receiving System

While the receiver used in our experimental work is not available commercially it does follow the more or less standard lines of the superheterodyne. The front end lacks r-f amplification since at these frequencies it has little practical advantage when using amateur equipment. A block diagram of the receiver is shown in *Fig. 2*.

The antenna is coupled directly into the crystal mixer stage. This mixer is one of the obsolete radar types. It has adjustments for varying the antenna input, oscillator voltage input and quarter-wave mixer tuning. A 1N23 crystal is used for mixing with the i-f output coming from the large or "cold" end of the diode. A broad-band cavity is used for

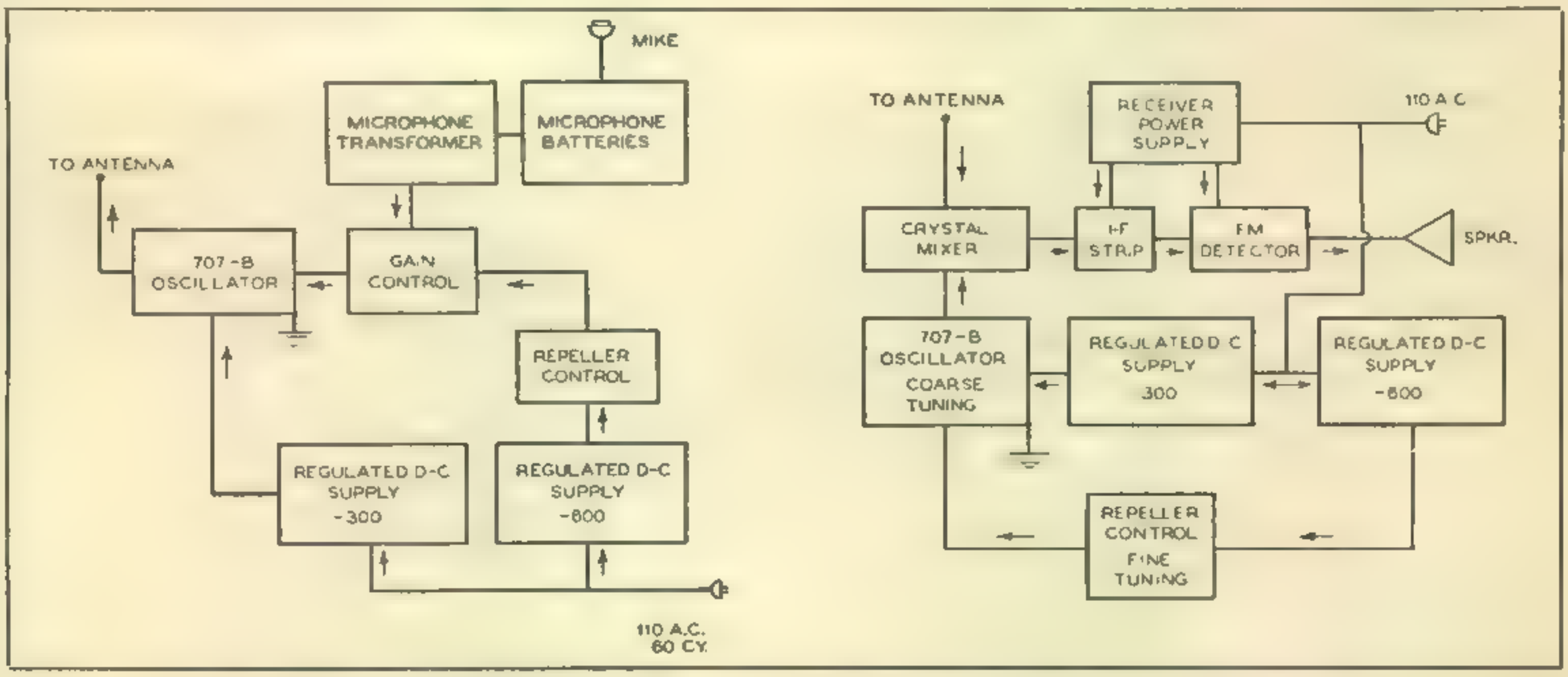


Fig. 1 (left). Block diagram of transmitter. Fig. 2 (right). Block diagram of receiver.

The equipment used at W1JSM with the exception of a modified antenna. The transmitter is essentially the same as that employed by W1OTH. The superhet has a broad band cavity control, indicating meter and integral wavemeter.

tuning the 707-B local oscillator. The cavity is simplicity in itself, consisting merely of a short section of rectangular tubing, fabricated from a flat thin brass sheet. It is closed at one end and provided at the other end with spring fingers and plunger to contact the four walls and be adjustable in position.

A hole is cut through the top and bottom walls of the cavity sufficiently large to pass the glass envelope of the 707-B. The fins of the oscillator tube were then soft-soldered in place in the holes. Some care is necessary in doing this job, but it may be made quite easy by first heating the entire tube until the glass envelope cannot be held in the hand. It is then positioned in the cavity and quickly soldered in place with a good hot iron (200 watts heat capacity). The soldering should be done before the tube has a chance to cool off; in any case apply the iron only to the cavity and allow the heat to be transferred to the fins through the solder. A fillet will be necessary and acid solder should be used. Give the whole unit a bath in alcohol afterwards.

Determining Frequency

The frequency of the local oscillator depends upon the position of the plunger in the broad-band cavity. As the total length between the closed end and the movable plunger is increased, the wavelength is increased. Output is taken from the cavity through a small loop into a type "N" connector. Type N fittings should be used as these are especially made to work into RG8/U and present a minimum of reflection in themselves.

The output from the crystal mixer passes into the i-f amplifier or "strip." These 30-mc and 60-mc i-f strips are fairly common on the war surplus market. They generally use 6AK5 tubes in from four to six i-f stages. The bandwidth is about two megacycles. Naturally, these wide bandwidths do not permit a high signal-to-noise ratio. Probably a much narrower bandwidth could be used in radio amateur communication, although some system of automatic frequency control would then be needed.

Each of the i-f strips has been modified to incorporate a cascade limiter and diode discriminator for FM reception. A switch was provided so that the audio amplifier could be shifted at will from the normal AM detector in the i-f strip to the new FM discriminator.

Regulation of the cathode and repeller voltage supplies for the 707-B local oscillator is absolutely necessary for good stability. The characteristics of the 707-B are such that a change of two volts in the d-c repeller voltage will change the frequency by about two megacycles. While this is an advantage in frequency modulating the transmitter, one can readily see that reception would be out of the question, unless the voltages were well regulated. Undoubtedly, electronic regulation of the oscillator d-c supply would improve receiver stability. It is also quite possible that when using a.f.c. the necessity for extremely close voltage regulation would be eliminated.

Acknowledgment

W1ILS, W1OTH and W1JSM were assisted in their tests by W1AQE, W1BHL, W1JYC, W1LNX, W1NXY, W1PAW, and Charles Richardson, all of whom are members of the El-Ray Radio Club of Waltham, Mass.

The equipment used by W1OTH. At the left are the two parabola beam antennas and wavemeter. The transmitter in the center uses a new type Klystron with an integral cavity. The simple receiver at the right uses a super-regenerative circuit.

The handful of transmitter is still not too crowded for ease of operation. The two condensers tuned by screwdriver adjustment through the front panel are C10 (top) and C6 (bottom). The crystal plugs in through the access hole in the front. S1 is located just below the coax connector J4. Power plug J1 and metering jacks J2 and J3 are the remaining front panel components.

The Mighty Midget

H. L. APPLE, W4HER*

Here's a 35-watt fixed station or portable rig that can hide behind a QSL card. To take the mystery out of how it's done, W4HER gives step-by-step procedure.

"MIGHTY MIDGET" aptly describes this ruggedly constructed compact transmitter. Although primarily employed by the writer for 10-meter mobile operation, it is equally adaptable to all bands. In spite of its extremely small size, 3¼" x 5" x 5¼"—yes, the front panel is no larger than a standard QSL card—and despite its light weight of only 3 pounds 4 ounces, the Midget packs a powerful wallop. Best of all it is constructed from standard full-size components throughout. The secret is careful attention to details.

Four tubes are employed in the rig. A 6J6 is used as an oscillator and first doubler, a 6AK6 as a second frequency doubler, a 2E26 as final amplifier and a 2E26 Class A modulator. A maximum input to the final tube of 35 watts is still within the ratings of the 2E26 up to 150 mc.

After trying many types of oscillator circuits the untuned Pierce was chosen. Any 7-mc crystal may be used, but of course by modifying the fundamental circuit, crystals of other frequencies will work. Since the output of the untuned Pierce oscillator has relatively low harmonic content, the extra section of the 6J6 miniature twin triode was used as a harmonic amplifier. The first half of the dual triode operates as a low current drain oscillator and drives the second section which has a very high grid leak conducive to high harmonic output. The stray capacity and tube capacity together were satisfactory to limit the amount of feedback in the Pierce oscillator with no indication of tube or crystal heating. For 10 meters the oscillator of the 6J6 operates on 7 mc with the output tuned to 14 mc, which in turn drives the 28-mc 6AK6 pentode doubler. This stage is shielded to prevent stray coupling to the final amplifier. High plate efficiency of the 2E26 final is assured by straight-through operation on 10.

The 2E26 modulator is capable of modulating the final 100% with approximately 10% distortion. Audio fidelity is within 3 db from 200 to 2000 cycles, excellent for speech work.

The four tubes require only 6.3 volts at 2.2 amperes for heater supply and 250 volts at 100 ma to 500 volts at 130 ma, depending on the input power to the final tube. This power may be supplied by various types of supplies, a 115-volt a-c unit for home station use, or vibrator pack or dynamotor for mobile use.

The primary of a push-pull output transformer was employed as the modulator transformer since it was readily available and economical.

Voltage for the microphone may be obtained from the cathode of the Class A amplifier, thus eliminating the use of a microphone battery. Plate voltage, heater supply, and microphone leads are all brought

*304 Union Ave., Burlington, N. C.

CRYSTAL	V1 PURPOSE	V1 OUTPUT FREQ.	V2 PURPOSE	V2 OUTPUT FREQ.	V3 PURPOSE	BAND
9.0	QUAD.	36.0	DOUB.	72.0	DOUB.	144.0
8.5	TRIP.	25.5	DOUB.	51.0	FINAL	51.0
6.8	DOUB.	13.6	DOUB.	27.2	FINAL	27.2
3.5	DOUB.	7.0	DOUB.	14.0	FINAL	14.0
3.5	STRAIGHT	3.5	DOUB.	7.0	FINAL	7.0
3.5	STRAIGHT	3.5	TUBE UNPLUGGED 100μμF FROM PIN 1 - 5		FINAL	3.5
36.0 ALTERNATIVE	DOUB.	72.0	DOUB.	144.0	FINAL	144.0

Chart of operating frequencies of transmitter stages in order to obtain output from 3.5 to 144 mc.

in through the jack *J1*, located on the front panel. Jacks *J2* and *J3* are used for an external meter to measure the plate current of the individual stages of the transmitter and are cut in by turning selector switch *S1*.

Method of Construction

The method of constructing the transmitter itself is simple if the proper assembly and wiring sequence is followed. The transmitter described is constructed from a surplus BC-357J radio receiver chassis which has an over-all dimension of 3 1/8" x 4 15/16" x 1 7/8". However, standard commercial chassis approaching these dimensions will be satisfactory. The chassis layout can be fairly accurately copied from the photos. Parts are labeled for easy identification. The front panel measures 5 3/8" x 3 7/16", but can be altered to suit individual requirements which will vary depending upon the exact dimensions of the case.

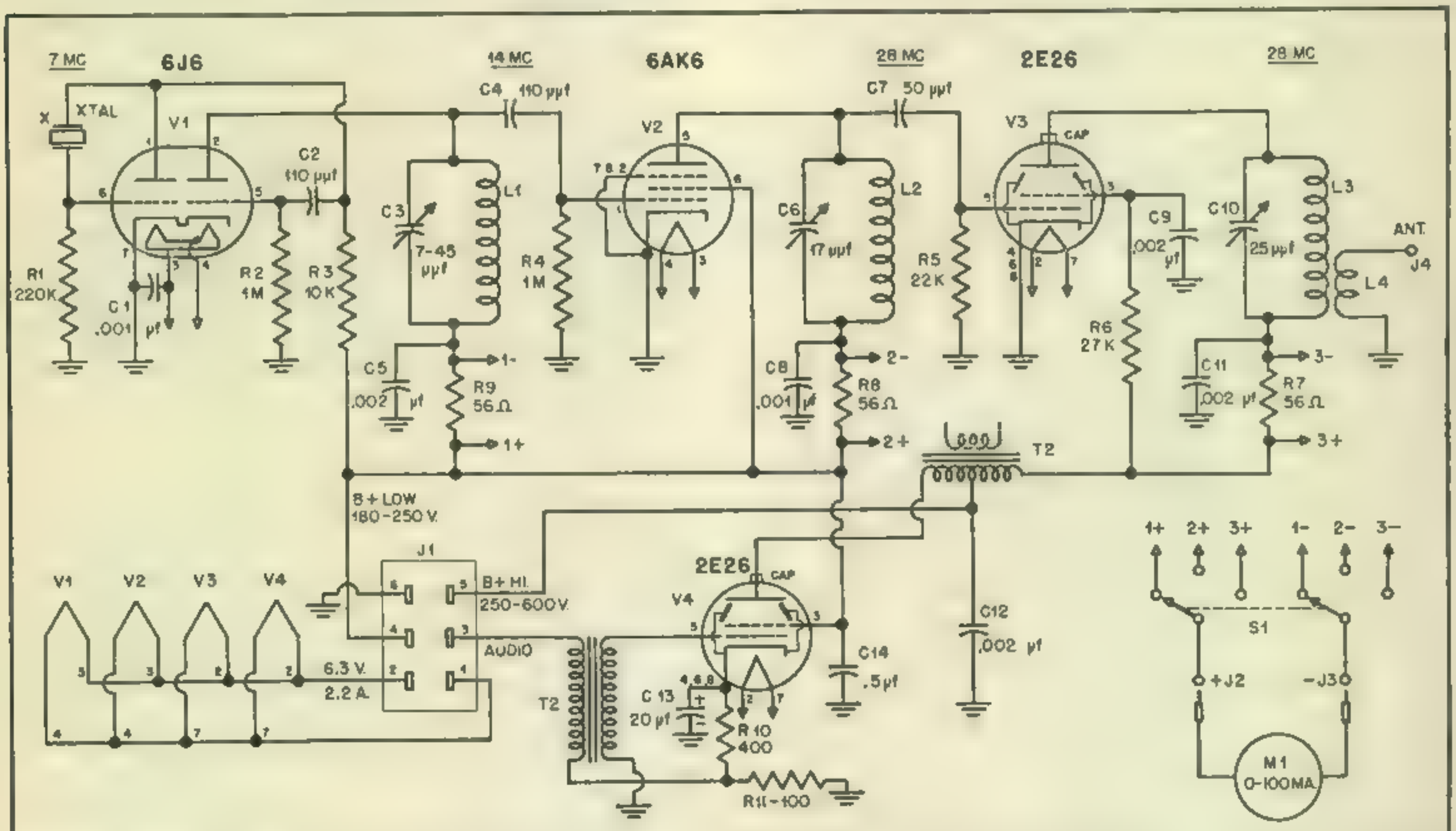


Fig. 1. Circuit diagram of the complete r-f and a-f portions of the Mighty Midget.

C1, C8, C16—1000 μμf, Ceramicon, Erie style L.
C2*, C4*—110 μμf, 300 v. d.c., mica.
C3—7-45 μμf, variable ceramic Erie N500.
C5, C9, C12, C15—.002 μμf, 500 v. d.c., mica, C. D. type 1W.
C6*—1.5-17 μμf, variable, Hammarlund style APC.
C7*—50 μμf, Ceramicon.
C10—1.5-25 μμf, double spaced, Hammarlund style APC.
C11—002 μμf, 1000 v., mica, postage stamp style.
C13—25 μf, 25 v. d.c., Aerovox type PRS.
C14*—0.5 μf, 600 v. d.c., bathtub.
R1*—220,000 ohms, ½ watt.
R2—1 meg., ½ watt.
R3—10,000 ohms, ½ watt.
R4—1 meg., ½ watt.
R5*—22,000 ohms, ½ watt.
R6**—27,000 ohms, 1 watt.
R7, R8, R9—56 ohms, ½ watt.
R10—400 ohms, 1 watt.
R11—100 ohms, 1 watt.
R12—32 ohms, ½ watt.
R13—27 ohms, 1 watt.
R14—78 ohms, 1 watt.
J1—6 connector Jones plug, style P-306-AB.
J2—Banana plug jack red, positive.
J3—Banana plug jack black, negative.
J4—Coaxial receptacle, Amphenol type 1R.
L1—30 turns No. 20 enam., ½-inch dia., 1-inch long. Form 1½-inch long solid phenolic rod.
L2—8 turns No. 20 brass, 5/8-inch dia., 7/16-inch long. Midget B&W No. 3008 coil.
L3—7 turns No. 18 brass, 7/8-inch dia., 5/8-inch long. Surplus ceramic form or air wound B&W No. 3016.
L4—2¾ turns No. 22 hook-up wire wound at cold end of tank.
M—0-100 ma. meter.
S1—3-position 3-pole rotor switch, Mallory style 3200 J.
T1—Input transformer, 500 ohms primary to 25,000 ohms secondary, standard midget size. Standard 1 x 1¼ x 3/8-inch core.
T2—Output transformer, 10,000 ohms plate-to-plate, secondary removed. 2 x 2¼ x ¾-inch core.
V1—6J6 twin triode or 3A5 twin triode.
V2—6AK6 power amplifier pentode or 2E30 power amplifier.
V3, V4—2E26 v-h-f beam power amplifier or 2E24 v-h-f beam power amplifier.

*Part of BC-357-J receiver, nearest commercial value may be used.

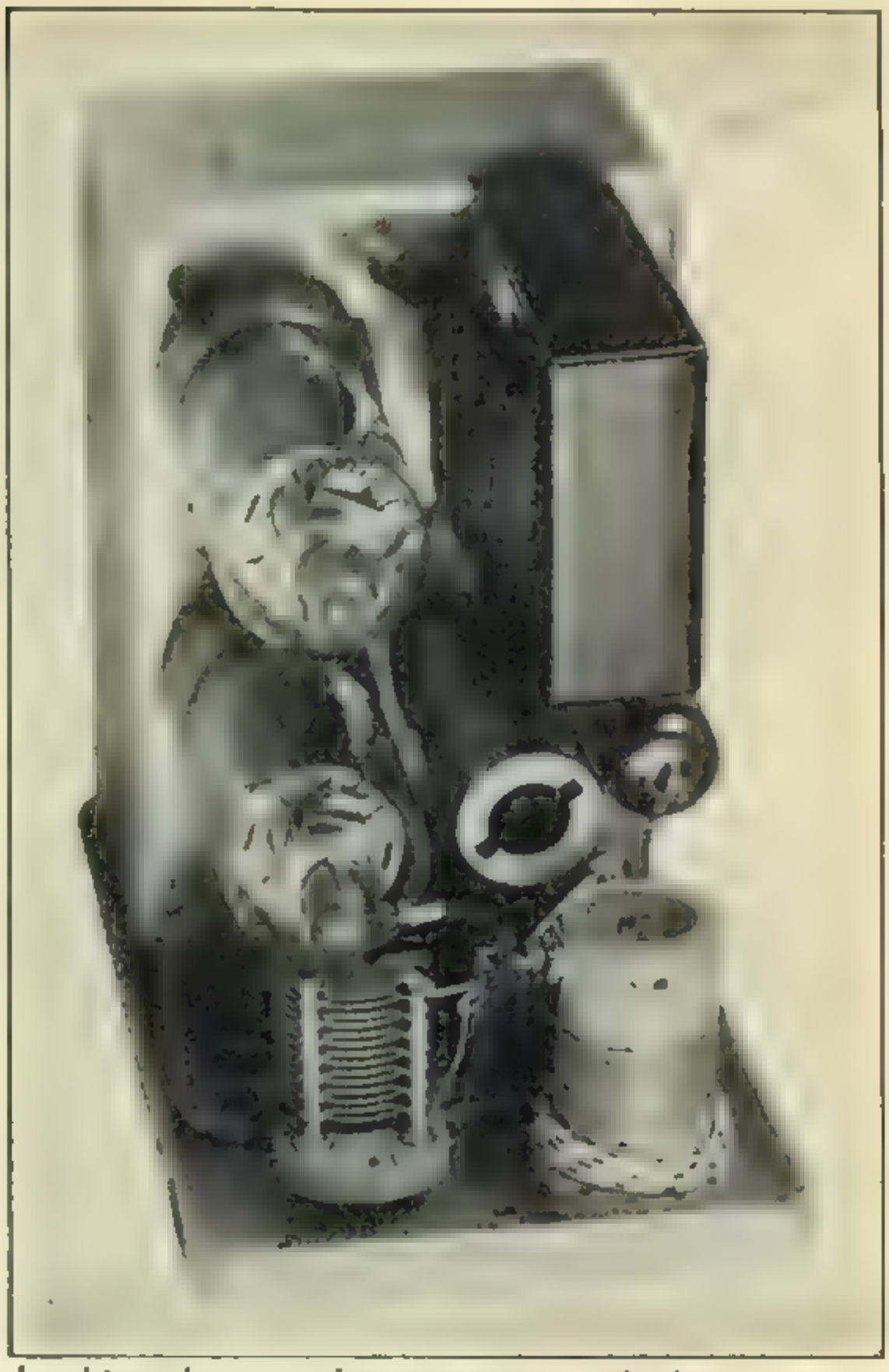
**To keep screen voltage within limits when changing plate voltage the value of R6 shall be as follows:

Plate supply	Screen dropping resistor
350 volts	18,000 ohms
400 volts	32,000 ohms
500 volts	35,500 ohms
600 volts	40,000 ohms

Sockets for *V3* and *V4* with keys located to the rear are mounted by 4-40 x ¼" machine screws. *V1* and *V2* are mounted orientated as are *V3* and *V4* with the addition of ground lugs. Positioning of these two sockets is unimportant. *J1* is mounted (numbers reading from top to bottom) with 4-40 x ¼" machine screws. Modulation transformer *T2*, crystal socket, variable condenser *C6* and *C10*, jacks *J2* and *J3*, coil and condenser assembly *L1* and *C3*, coil *L3*, condenser *C14*, antenna post *J4* and meter switch *S1* are all mounted in sequence.

Wiring

The transmitter is now ready for wiring. First the filaments should be wired, followed by all B+ leads. The modulation transformer, *T2*, B+ and r-f load leads are fed through a chassis grommet with the B+ lead terminating on terminal 5 of *J1* and bypassed by *C12*, and r-f load lead terminating on the B+ feedthrough. The modulator lead is connected to the cap of *V4*. The crystal socket and meter leads are fed through another chassis grommet. Ground lugs are installed near the right-rear corner under the screw of *J1* nearest terminal 6 and under the bottom right-hand screw of *J4* (back view). All ground wires should be installed at this point. Resistor *R1* is soldered from pin 6 on *V1* socket to the nearest ground. Condenser *C1* is soldered from pin 4 on *V1* socket to the nearest ground. *R2* should be mounted in the same manner, using pin 5 of *V1* socket. *R4* is soldered from pin 1 of *V2* socket to one of the ground lugs. *C4* is connected from pin 2 of *V1* socket to pin 1 of *V2* socket, all leads being made as short as possible. Condenser *C5* is mounted from the end of *L1* furthest away from chassis to nearest ground. *C2* is connected between pins 1 and 5 of *V1* socket. Resistor *R3* is soldered from pin 1 of *V1* socket to the B+ terminal of *C14*. *R9* is soldered from the end of *L1* away from the chassis to the B+ terminal of *C14*. Condenser *C7* is connected between pin 5 of *V2* socket and pin 5 of *V3* socket with *R5* connected between pin 5 of *V3* socket and ground. Bypass *C8* is soldered from "cold" end of *L2* to pin 2 of *V2* socket which is connected to the ground lug near the right-rear corner. Resistor *R8* is soldered from the cold end of



Looking down at the transmitter with dust cover removed. The 6AK6 is in the shield. The variable condenser is C10. The inductance L3 on which the link L4 is wound just hides C11.

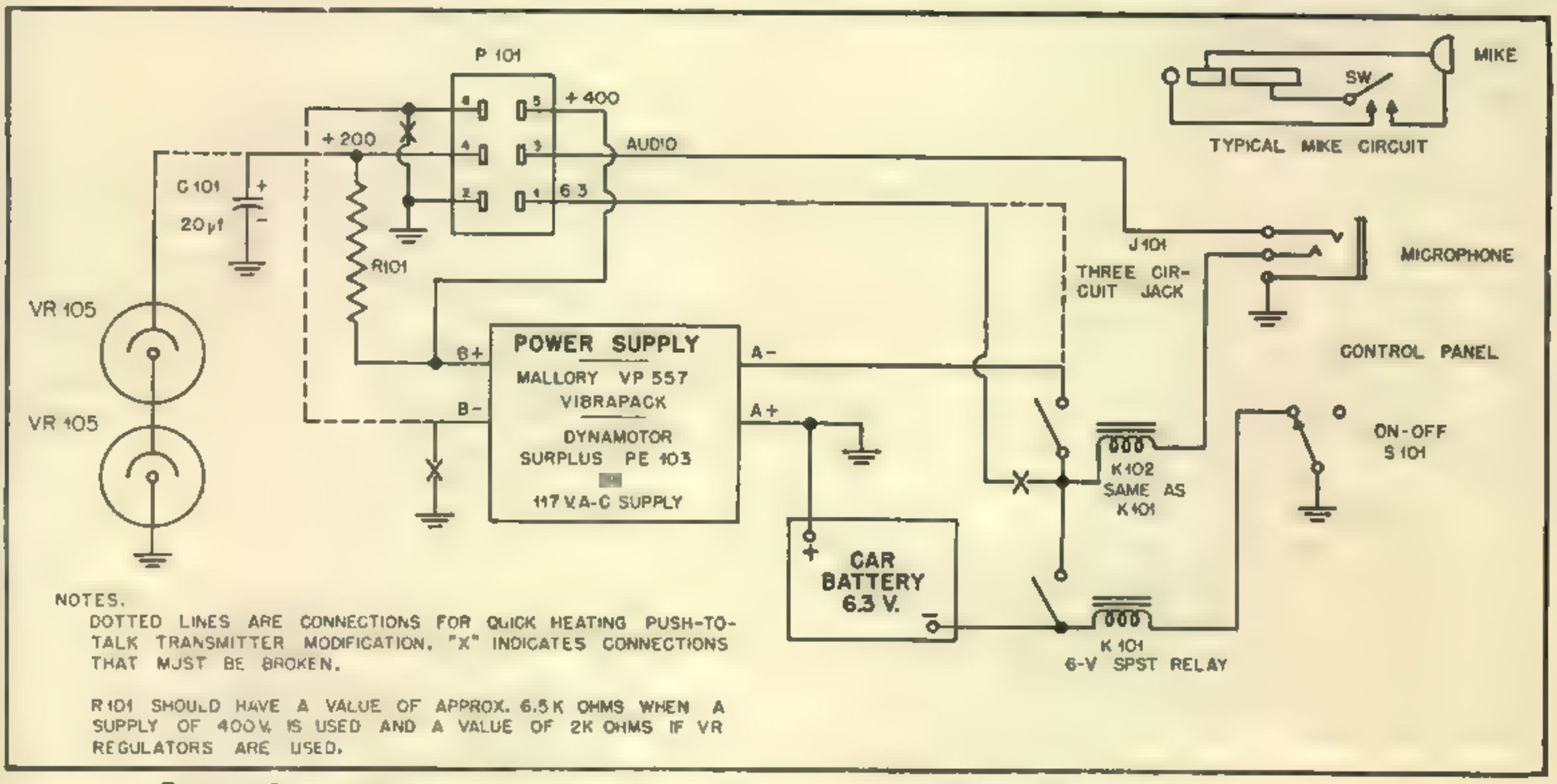


Fig. 2. Circuit diagram of d-c and control circuits for mobile or fixed station operation.

The bottom of the Mighty Midget is full, but not overcrowded. Inductance L2 is mounted directly behind C6. T1 occupies most of the rear portion of the under chassis. Wiring sequence of resistors and condensers is outlined fully in text.

L2 to the B+ end of *C14*. *R6*, the screen dropping resistor, is connected from pin 3 of *V3* socket to the B+ feedthrough. Bypass *C9* is soldered from pin *3* of *V3* to nearest ground (pin 8 of same socket). *C11* is soldered from cold end of *L3* coil to ground lug on *J4*. *R7* is connected between cold end of *L3* coil to position 3 on switch *S1*. *R10* and *C13* are connected from pin 8 on *V4* socket to ground for *C13*, and *R10* to the junction of *T1* and *R11*. The other end of *R11* is connected to ground terminal of *C14*. *T1* is wired as shown. *L4* is made of 2¾ turns of No. 22 hook-up wire wound around the cold end of *L3* and the end nearest to *L3* connected to *J4* while the other end is connected to the ground lug mounted on *J4*.

Tubes *V1*, *V2* and *V3* obtain their bias from grid leak resistors. *R6* is the screen dropping resistor for *V2* and should be selected to cover the voltage supply needed. The crystal is easily accessible from the front panel since it is mounted with part of the holder protruding permitting easy replacement. For multi-band operation standard miniature plug-in coils can be installed.

Conversion for Direct-Heated Filaments

To build the Mighty Midget for direct-heated filament operation where instant heating is desired, a 3A5 is substituted for the 6J6, a 2E30 for the 6AK6, and the two 2E26s are changed to 2E24 beam power tubes. R12 is added to drop the filament voltage to 2.8 volts for the 3A5. The bias voltage for *V4* and microphone voltage are supplied by the two resistors *R13* and *R14* which are located in the negative of the power supply and filtered by *C13*.

Fig. 2 shows a typical power supply connection. Any available supply, dynamotor, vibropack, or 117 v. a-c supply may be used as long as the transmitter power requirements are met.

Postscripts

Naval Reserve—K2NR

Naval Reserve Electronics Battalion 3-18 meets Tuesday and Thursday evenings at 7:30 p. m. Bldg. 558, New York Naval Shipyard, Brooklyn, N. Y. All hams and friends are invited to visit the shack by dropping a line or QSL card requesting pass to Lieut. A. Stangel, W2JZH.

Wesco Amateur Radio Society

Hams of Westmoreland County, Pa., have formed the Wesco Amateur Radio Society and extend welcome to all interested hams and SWLs in that vicinity. Meetings will be held at the YMCA in Greensburg on the 1st and 3rd Tuesdays of each month at 8 p.m.

AACS Amateur Network

To make AACS amateur activity as widespread as possible, the following frequencies, operating times and means of identification have been established by the 1st AACS Wing. Identification on both phone and c.w. is CQ AACS. Daily operating period is from 2000 to 2300 EST. Frequencies (plus or minus 5 kc) are: Phone: 3910, 14,220, 28,600, and 52,000. On c.w.: 3610, 7030, 14,030, and 28,020.

The 5th AACS Wing is setting up a European AACS net similar to that for the 1st Wing. W4KHM (28,600 kc) is scheduling D4AVL (28,400 kc) on Mon., Wed., and Fri., at 1230 EST to exchange net information and traffic.

QSLs from Eastern Air Lines

Ham employees of Eastern Air Lines are receiving free QSL cards. R. J. Miller, a ham in the communications department of Eastern at Miami, designed a card with Eastern's system map and duck-hawk insignia as a background for station call, etc. Pleased with the card, Miller offered to supply similar cards free of charge to other ham employees. Eighty hams took advantage of his offer and over 15,000 cards have already been distributed.

Disaster Messages

Before telegraph and telephone service could be restored to the hurricane stricken area of Miami, Fla., glass replacements were being rushed from the Pittsburgh Plate Glass Co., thanks to the cooperation of W4FCL and WØUZL. The manager of the glass company's warehouse at Miami sought the assistance of W4FCL in Coral Gables who contacted WØUZL in South Dakota. He in turn phoned to the firm's Chicago warehouse a message specifying plate and window glass sizes needed to minimize looting and further damage to business establishments and homes in the Miami area.

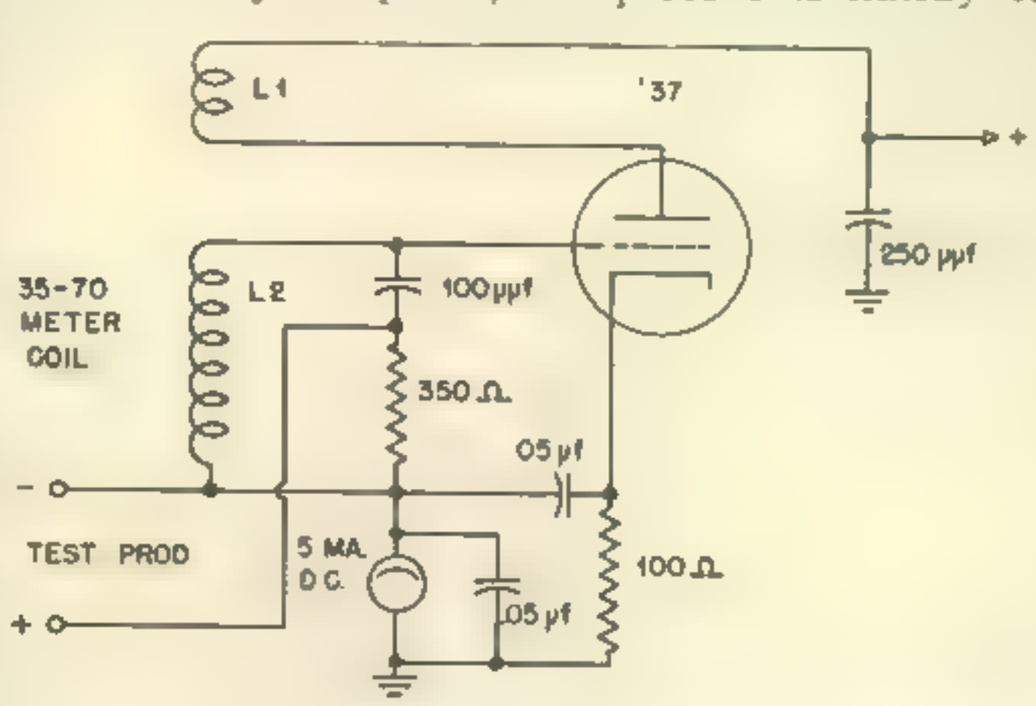
Inside the

SHACK AND WORKSHOP

Conducted by A. DAVID MIDDELTON, W1CA*

Condenser Tester

This tester will test condensers even when they are connected in a circuit. A 35–70 meter plug-in coil, a 37 tube (I found this the best type) and a few assorted junk parts, complete this handy test



unit. A 0–5 d-c milliammeter is used as the measuring device. The polarity of the test plugs must be observed for proper operation of the unit.

E. B. Allen, Atwater, Calif.

20 and 40 Meters With the BC-459A Transmitter

By the simple expedient of switching the fixed air padder (across the PA coil) in and out of the circuit, efficient operation may be realized on both 20 and 40 meters. It is necessary to uncouple the PA tuning condenser from the drive and shaft mechanism and run its shaft out the side of the unit through a fixed or flexible coupling. This shaft is at ground potential. The oscillator tuning remains unchanged.

Only 20-meter operation was contemplated at W2VNU/8 so band switching was not incorporated. The "hot" end of the fixed air padder, *C67*, in the schematic was disconnected. There is, however, sufficient space along the side of the unit to mount a SPST switch for bandswitching.

Edwin W. Hannum, W2VNU/8

I-F Alignment Without Test Gear

It is suggested that this can be accomplished by obtaining regeneration between the second and first detectors. The second detector tube is removed from its socket, a lead is twisted around the plate pin and the tube is replaced. This lead is *lightly coupled* to the first detector grid wire. Having determined that regeneration can be obtained, and it may be necessary to temporarily unsolder any second detector plate bypass in order that the i-f system may oscillate, the i-f gain control is set half way and a steady signal is tuned in with the crystal in the circuit, and the b.f.o. turned on.

This temporary lead is then moved in relation to the first detector grid wire until the i-f system goes in and out of oscillation with slight alteration of the gain control. Having carefully put the signal on the nose, back off the i-f gain control until oscillation just stops. Adjust each trimmer for maximum signal strength. As correct settings are found, and they will be critical, oscillation will restart, and further backing off of the gain control will be necessary. Care should be taken that the signal is kept accurately tuned during the process.

The temporary lead may then be removed, or if the increased selectivity is found useful, it can be made a fixture. Apart from the increased sensitivity, the selectivity can be brought to the point where c.w. is unreadable.

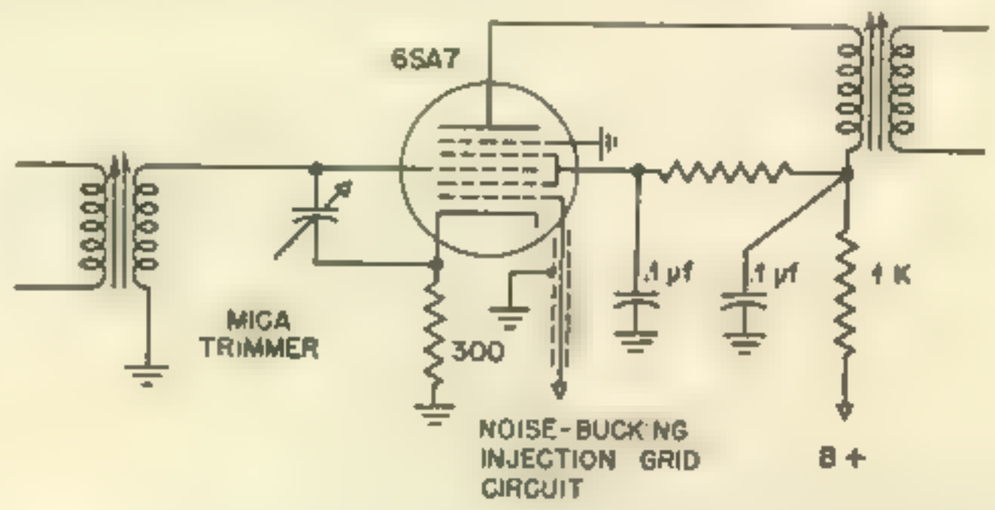
Coupling to the first detector may alter the calibration 50 kc or so on the 14-mc band, but this can be compensated for by moving the grid wire in relation to the nearest grounded component.

Charlie McCarthy, EI6G

Neutralizing that Oscillating I-F Stage

Considerable trouble with oscillation was experienced with a 6SA7 used as a 460-kc i-f stage in the standard noise silencing circuit, using high-*Q*, high-gain "perma-clad" or iron-cored transformers. Shielding of leads proved of no avail, a measure not suited to these transformers as they are almost pure inductance. The circuit shown proved to be the solution, with little loss of gain.

It can be seen that the cathode, unbypassed, will have a voltage on it, out of phase with the plate. The setting of the trimmer is not very critical; in this case it was screwed up nearly tight.



It is quite common that high-gain tubes, such as the 6SA7, 6AC7, 6SH7, etc., with large plate capacities, will self-oscillate when connected to a high-*Q* grid circuit. The foregoing is the only effective cure I have yet seen.

William Jolly, Adelaide, Australia

Inexpensive Feeder Spreaders

Need some lightweight plastic feeder spreaders—cheap? "Toni" plastic hair curlers come already molded with two slotted holes. The center-to-center spacing is 2-¼" and the holes are right for No. 20, 18 or 16 wire. Since the plastic is easily worked and there is plenty of material around the hole, it should be an easy matter to drill them out for larger wire. A bit of Duco household cement does a fine job of holding the spreader to the wire. The cement can be squirted in through the slot.

The shape is ideal, since it places a lot of material around the wire, where it's needed, and a minimum of material in the center, where it does little good and increases the weight and wind resistance. The best part of all is the price: two dozen for about 25c. They can be purchased in drug, dime or department stores.

William L. Smith, W3GKP

**Address all contributions to S & W Department c/o CQ, 342 Madison Ave., N. Y. 17, New York.*

The 6-Meter Band in Argentina

JAVIER EDUARDO POLEDO, LU5CK*

March is expected to be the last month for 50-mc openings to South America. Here's the gang holding down the Argentine end.

ALTHOUGH THE ACTIVITIES OF THE Argentine radio amateurs transmitting in the v-h-f bands are well known in South America, they did not attract any great amount of interest elsewhere until recently. Therefore, with the general consent of some of my colleagues I would like to acquaint our friends in the English speaking countries with the history of our activities, a description of some of our equipment and an introduction to some of our more active 6-meter hams.

Argentine activity on 5 meters began in 1933. A few of our more adventuresome amateurs were very successful and in 1934 the Radio Club Devoto was formed for the exclusive purpose of experimenting at these wavelengths. Later, in 1937, the Radio Club Argentino organized an international contest on 5 meters which was won by W6LQN, an associate member. The winner in the South American zone was LU8DJE, who is still very active on 5 and 6 meters. Similar contests were also organized in the following years, and from 1942 to 1945 most of our activity was confined to contests in the 5-meter band.

During this period activity was very high and as many as 300 stations in the city and environs of Buenos Aires were contestants. Using portable equipment we extended communication first to a record of 360 km (about 225 miles) and then to 650 km (about 400 miles) on ground wave. In 1947 a record of 620 miles entirely within Argentina was established with the help of sporadic-E layer reflections. Our W colleagues must bear in mind that there are very few 5 or 6-meter stations outside of Buenos Aires and until recently we have been unable to take advantage of "short-skip" which is so common in the summertime.

The 6-meter band became available to us on April 12, 1947. Those who were active on 5 meters quickly redesigned and rebuilt their equipment for the new 6-meter band. The Fall of 1947 gave us an opportunity for international work. LU6DO worked XE1KE on Aug. 27 at 1850 local time, LU5CK worked OA4AE on Sept. 10 at 2223 local time, and so forth throughout the Fall with many contacts with such stations as PY2QK, OA4BG, TG9JW, CE1AH, LU9MA, PY1GJ, PY1DS, PY2AC, LU4ME, etc. It is believed that these contacts are complex reflections from the sporadic-E layer since most of this work has been taking place during the night at Buenos Aires.

On Oct. 13, 1947, at 1759 local time, LU9EV made the first W-LU QSO. He contacted W5VY on c.w. However, at that time there was strong radiotelephone interference from W8ZVY. LU9EV gave a report and asked W8ZVY to QRX while he finished with W5VY. After signing with W5VY, LU9EV could not then hear W8ZVY as conditions had already deteriorated. This is the long-range record for Argentine 6-meter stations.

Some of the Equipment and Operators

LU9MA is one of our most active stations. Operated by E. Fantana, the station is located in the zone (state) of Los Andes cordillera about 600 miles to the west of Buenos Aires. LU9MA has worked most of the sporadic-E skip DX, but has heard only XE1KE. LU9MA also heard on Nov. 11, 1947, at 1625 local time, W7HEA in Toppenish, Wash. At that time W7HEA was received as QSA5 and S8 with a very slow rolling QSB. Unfortunately, W7HEA did not hear LU9MA. The transmitter here is 50 watts input to a single 3E29. A converter employing a 6AC7 r.f. and 6K8 mixer into a standard communication receiver is used for receiving.

LU6DO is the leading and most active of all of our 6-meter stations. LU6DO is located in Temperley, Province of Buenos Aires. His equipment is rather modest, ending with an 807 with 35 watts input. The transmitter is v-f-o controlled and feeds into a four-element rotary beam with a folded dipole as the radiating element. His biggest problem at the present time is feeders, as the 300-ohm twin lead is still not available. A vertical mixed coaxial antenna is also used with very good results.

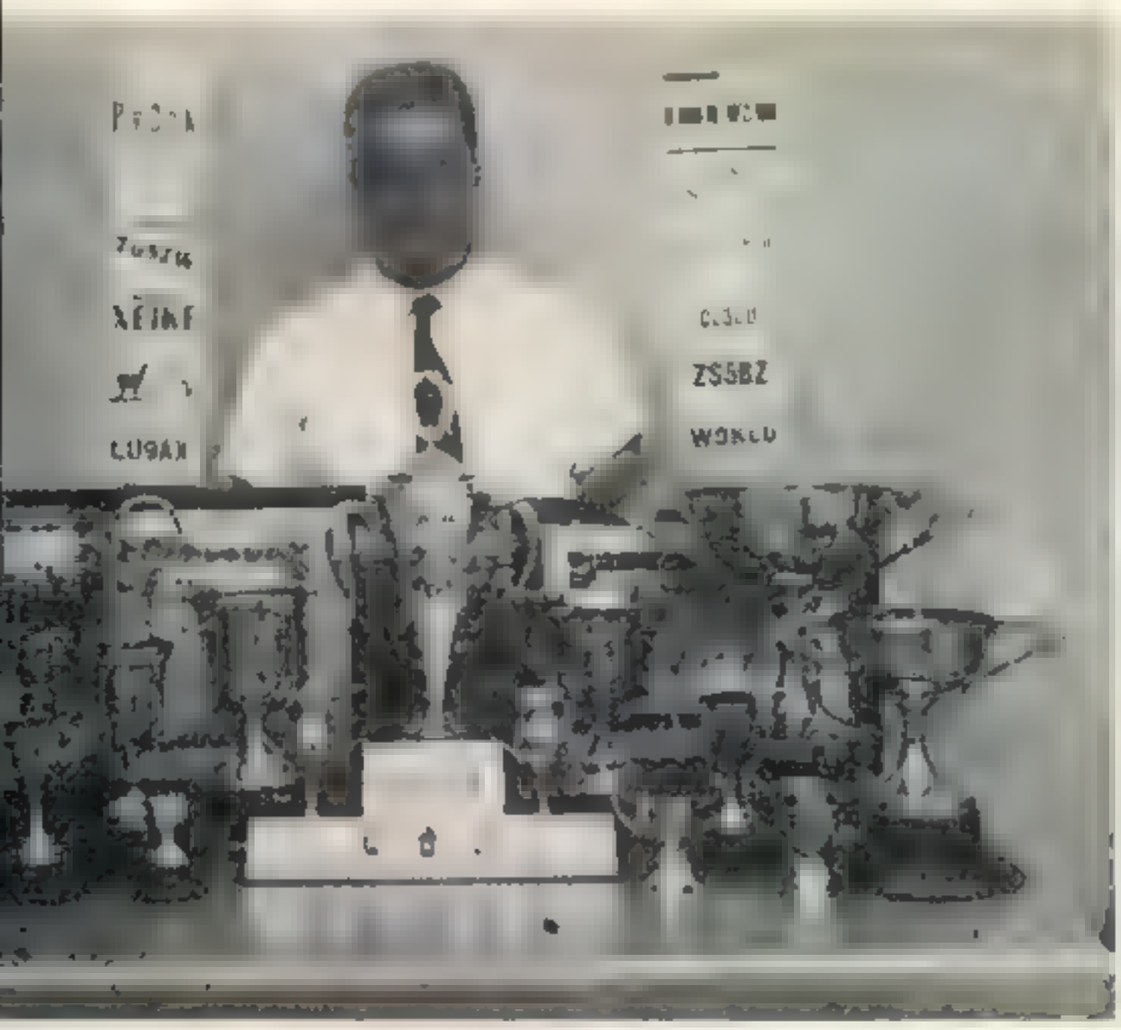
LU9AX, Ernesto Guerrini, known as the Old Man, is an indefatigable worker on every amateur band, c.w. as well as phone operation. At this writing, his is the most powerful of the 6-meter

*Galvan 3074, Buenos Aires, Argentina.

Some of the Argentine 6-meter gang. Left to right; LU1DO, LU1AM, LU4BO, LU4DI, LU5DJH, LU5BE, LU4BS, LU8BQ, LU8AT, LU6CK, LU4CD, LU7CB, LU1CC, LU6DO, LU3BD, LU5AR and LU5CK.

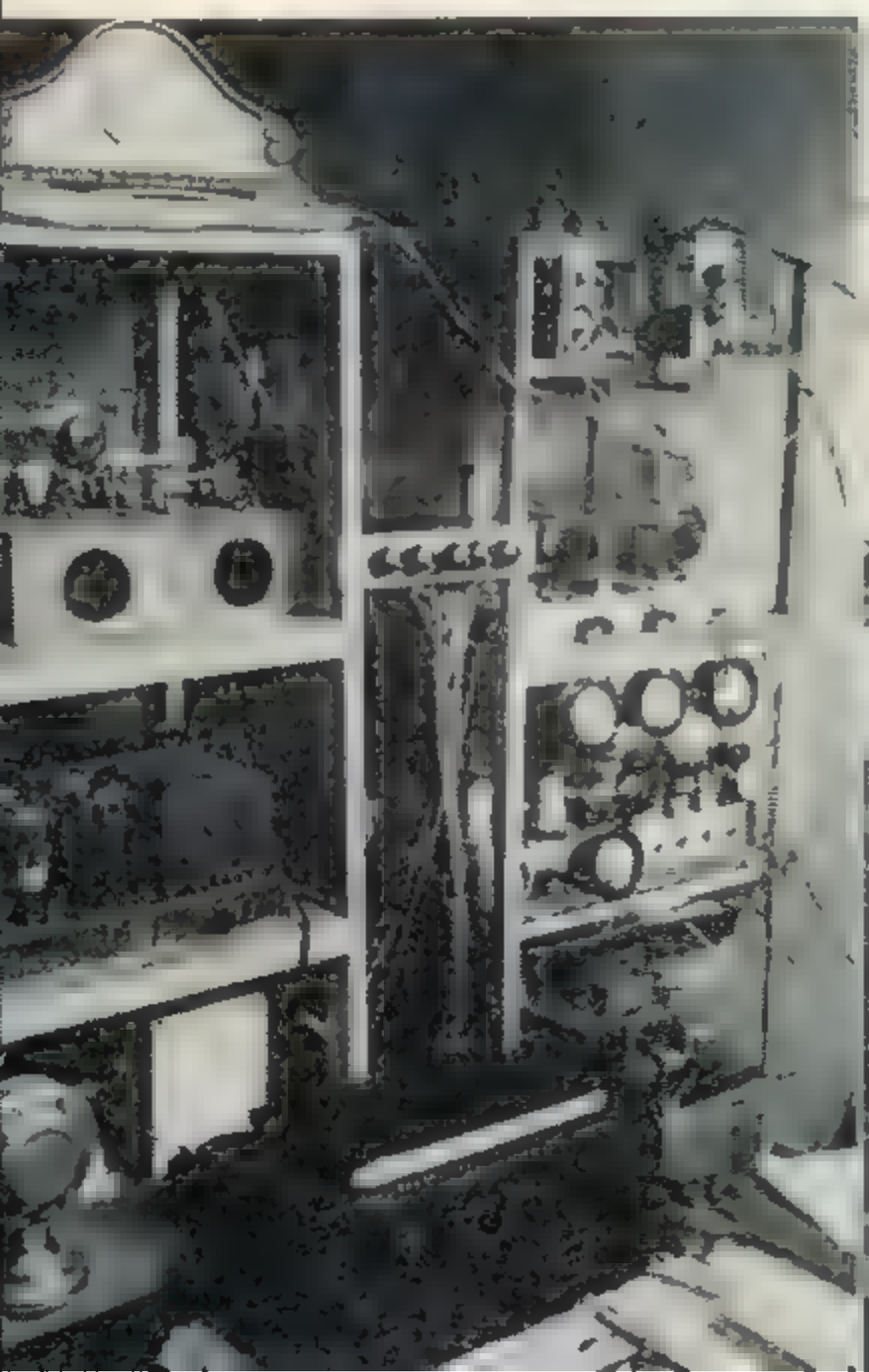
stations. The transmitter consists of a 59 v.f.o. on 48 meters and doubling to 24, followed by a 6L6 doubling to 12 meters and an 807 doubling to 6 meters. The final is push-pull 35TGs. Six countries have been worked using either the 20-meter antenna or a 6-meter dipole.

The Argentina recordman on 6 meters in LU9EV, Collin H. Grattan. Collin has worked seven countries and is, from his operation on other bands, one of our best-known amateurs. The 6-meter equipment here is an 800 final with 85 watts input with a three-element 6-meter rotary beam.



Above: LU5CK with trophies won in DX contests. Right: LU8AT's transmitter is an example of those currently in use by the Buenos Aires gang - a crystal oscillator using a 6L6, 807 and 3E29 final with 85 watts input. Below: LU5CK's experimental 50-mc final using an 826 is at the left; a multiband transmitter on the right.

Above: Homemade station of LU1DO runs 100 watts on 10 meters and 80 watts on 6 meters. Below: LU1AM has only 220 volts d.c. from the house current supply. The transmitters use mostly 25L6 type tubes. The cards on the wall are for sporadic-E contacts with XE1KE, PY2QK, and OA4AE, all on 6 meters.



Owner of the smallest station on 6 meters is Pablo Richeri, LU7CB. He uses a single 6V6 with about 2 watts input. This does not deter from the fact that he has worked PY2QK and has a ground wave of a little over 15 miles. LU7CB will soon be on both 10 and 6 meters with 100 watts. Another low-power station is LU1AM, Ernesto Arechaga, who uses the 220-volt d-c house current as the plate voltage for either 25L6 or 25A6 tubes. The transmitter is all v.f.o. using three more 25L6 tubes, and the output feeds into a delta-fed half-wave antenna.

Enrique Sarda, LU1DO, is using a four-element beam mounted on the same frame as his 10-meter antenna. His transmitter uses a 6K6, 6L6 and 3E29 with 80 watts input. The converter uses a 6AC7 r.f., 6AC7 mixer and 6J5 oscillator into his regular 14-tube communications receiver. Somewhat similar equipment is used by LU8AT, Evaristo R. del Rio, starting from a 5.55-mc crystal into a 6L6GA, 807 and 3E29 with 85 watts input. This station is also used from time to time by LU5CK.

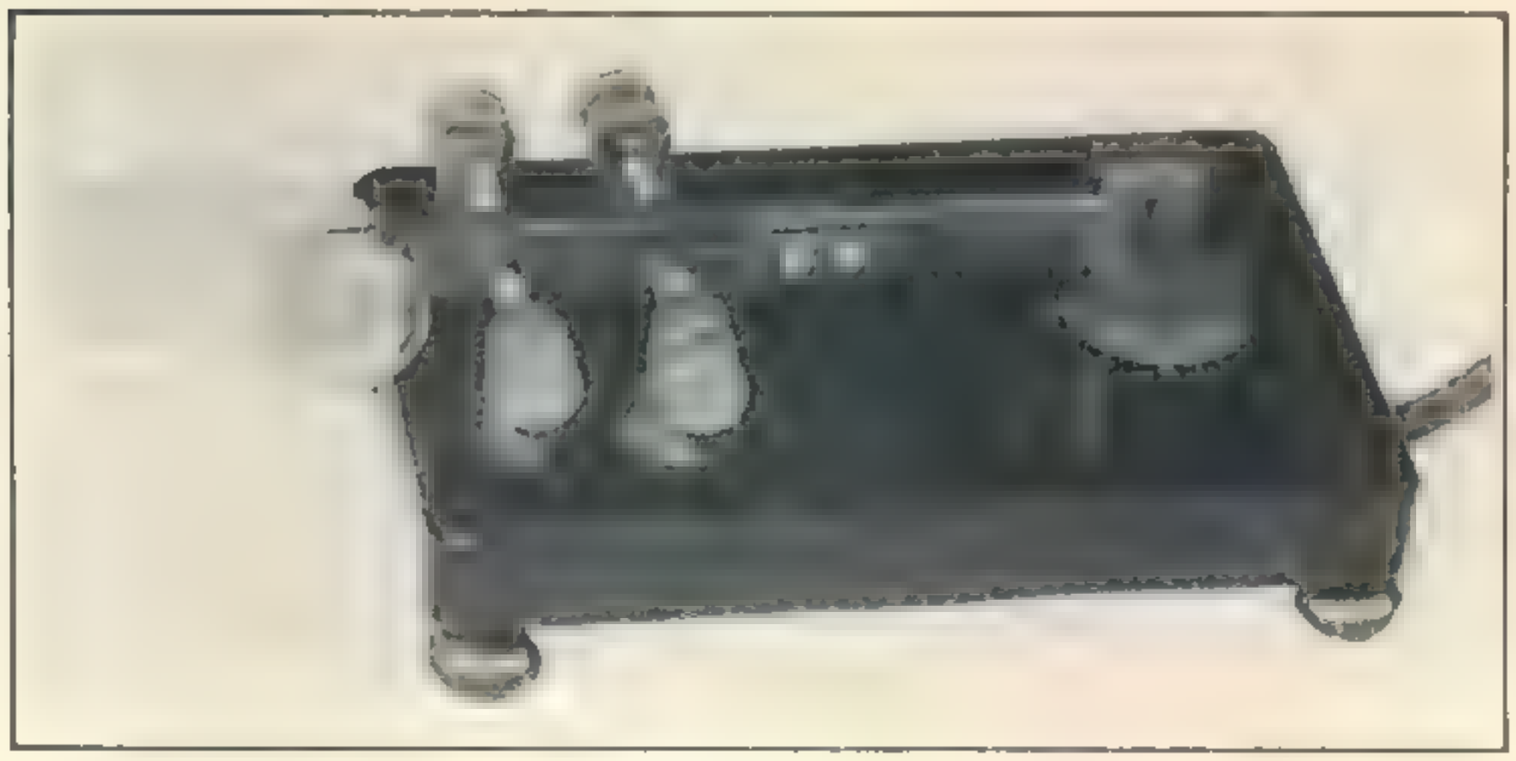
LU8BQ, Memesio Rodriguez, who is also very active on 6 meters, uses a pair of 6L6s in the output stage of his v-f-o controlled transmitter. These run at about 70 watts input. A great contestant in our 6-meter activities is LU2AO, Augusto Osorio. His transmitter is a 6F6, 807 into an 832 with about 35 watts input. For receivers he uses a National 1–10 or a specially built three-tube converter into a Meissner receiver.

The mystery station on 6 meters from Buenos Aires is LU4CD, Gonzalo Flores. Because he uses so much equipment it is often difficult to say exactly what he will or will not be using. The design of his station is such that either crystal or a BC-221 as a v.f.o. may be used at any time. These are then link coupled into a variety of buffer and amplifier stages, ending generally with a pair of 35Ts on 6 meters with 250 watts input. At writing, the favorite 50-mc antenna is a "twin-three," although it is expected a square-corner reflector of 20 elements will be in operation by the time this appears in print. Converters into a National HRO, Hammarlund Super-Pro, or BC-348 may also be used at any time.

Lastly, the author, LU-5CK, uses a 41 tube as crystal oscillator, 6L6G doubler, 807 and 826 final with 125 watts input. A converter using 6AC7 and 9001 feeds into a special multiband receiver, or a BC-348Q.

There are numerous other Argentina stations who are active, such as LU-4DD in La Plata, LU4DI and LU5DJH in Avellaneda, LU3BAC and LU-1CC in Buenos Aires City, all of whom are using the popular 3E29 with from 60 to 80 watts input. Equipment is becoming available and we expect to be on the air regularly with more power and more sensitivity in our receivers in anticipation of the possible last splurge of F2-layer DX during March and April, 1948. As you can see, activity on 6 meters is not lacking in the Buenos Aires area or around Mendoza. We are anxious to further any research programs and will be glad to make any schedules which might result in 50-mc communication between North and South America.

Similar in appearance to conventional semi-automatic keys, this unit produces dots electronically.



How Are Your Dots?

RICHARD G. TALPEY, W2PUD*

Electronic dots from a semi-automatic key with a conventional swing offer habit fixed bug or sideswiper operators the chance to take advantage of electronic keying.

ELECTRONIC DEVICES for keying are developed for two primary purposes—to provide effortless sending with a consequent reduction of fatigue, and even more important, to permit uniformity of the transmitted characters. Various forms of electronic keys have appeared in amateur literature, some of which were widely duplicated.[1] Unfortunately, veteran sideswiper swingers and bug operators already habit fixed find it extremely difficult to employ an electronic key. To overcome this personal sense of frustration when we were unable to master the change, this semi-automatic key that produces automatic dots electronically was developed. It permitted a painless transition from the conventional bug and has performed beautifully.

In addition to the other benefits of the electronic key there is a very important operating convenience worth pointing out. The necessity to pause when adjusting the weights on a bug is frequently a nuisance. It is inevitable with a mechanical system that the ratio of dot lengths to space will not remain constant at different speeds. The critical contact adjustment required on most bugs is evidenced by the number of signals commonly heard with improperly adjusted dots. With electronically formed dots it is possible to vary both character lengths and spacing, keeping them equal for optimum uniformity, even while transmitting, something often desirable under varying operating conditions.

Circuits for most of the automatic or electronic type keys previously described have required several sets of key contacts, complicated relay adjustments, insulated key arms, etc. These undesirables were eliminated in the system described, which incorporates the following features:

1. Key arm and base at ground potential.
2. Speed continuously adjustable by a single knob during operation.
3. Dot length always equal to space regardless of speed.
4. No critical adjustments.
5. Simplicity of key and circuit.

Utilizing a Cathode-Coupled Multivibrator

The circuit used, as shown in *Fig. 1*, is a cathode-coupled multivibrator.[2] The dots are made by the multivibrator and the dashes are made manually. The cathodes of both tubes (two sections of a double triode) float above ground until the key is pressed. When the cathode circuit is grounded, tube *V1* con-

*59 Orland Rd., Rochester 9, N. Y.

[1] Bane, "The Dadit," *CQ*, June, 1947.

[2] Pullen, "The Cathode-Coupled Amplifier," *Proc. IRE*, Vol. 34, pp. 402–405, June, 1946.

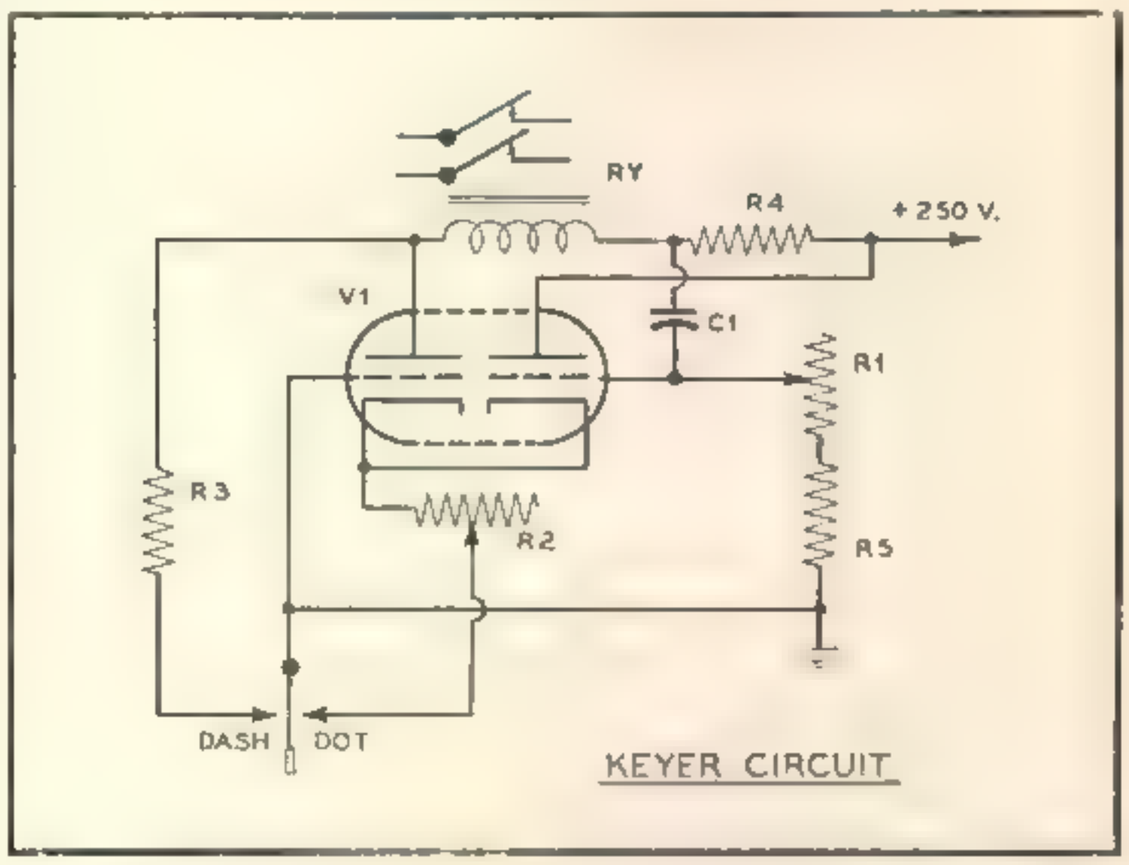
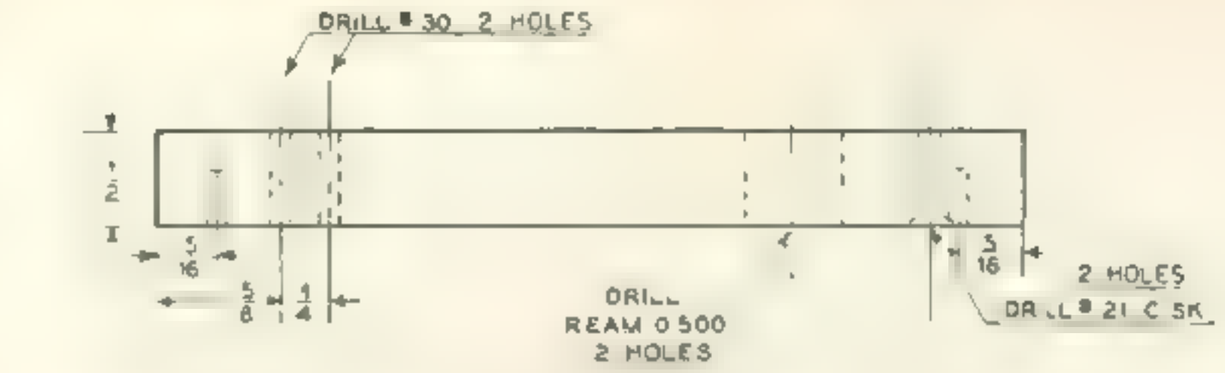
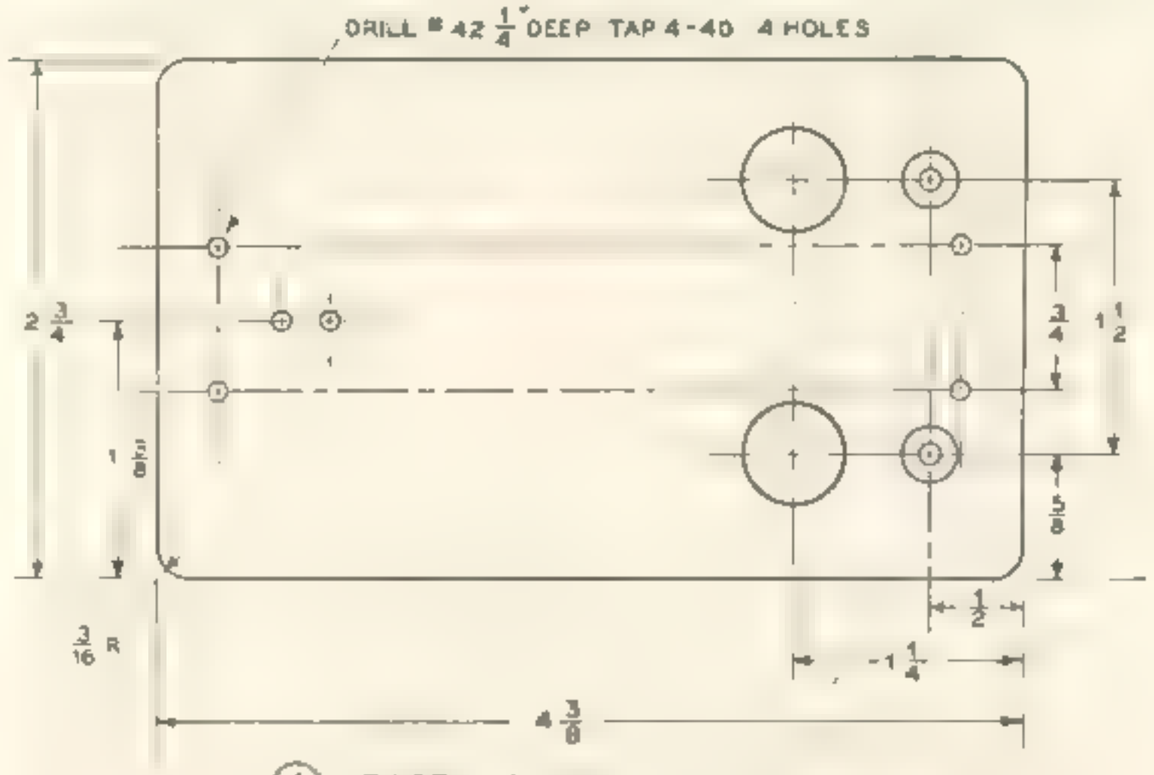
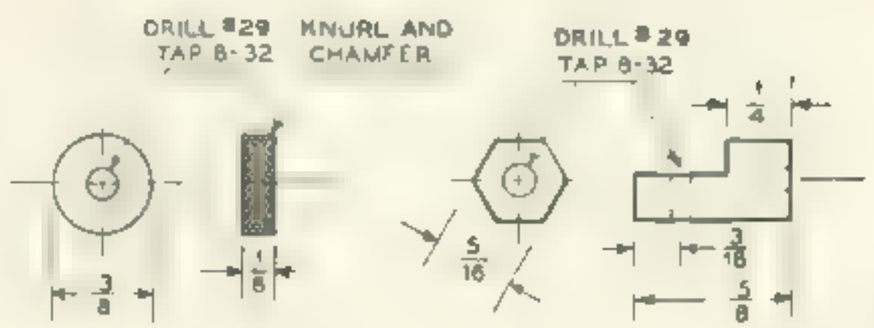


Fig. 1. Cathode-coupled multivibrator circuit used to produce automatic dots when keyed.
R1 — 100K pot. C1 — 0.25μf, 400 v., paper.
R2 — 2K pot. (screwdriver adjustment). Ry—See text.
R3, R4, R5 — 56K, ½ watt.



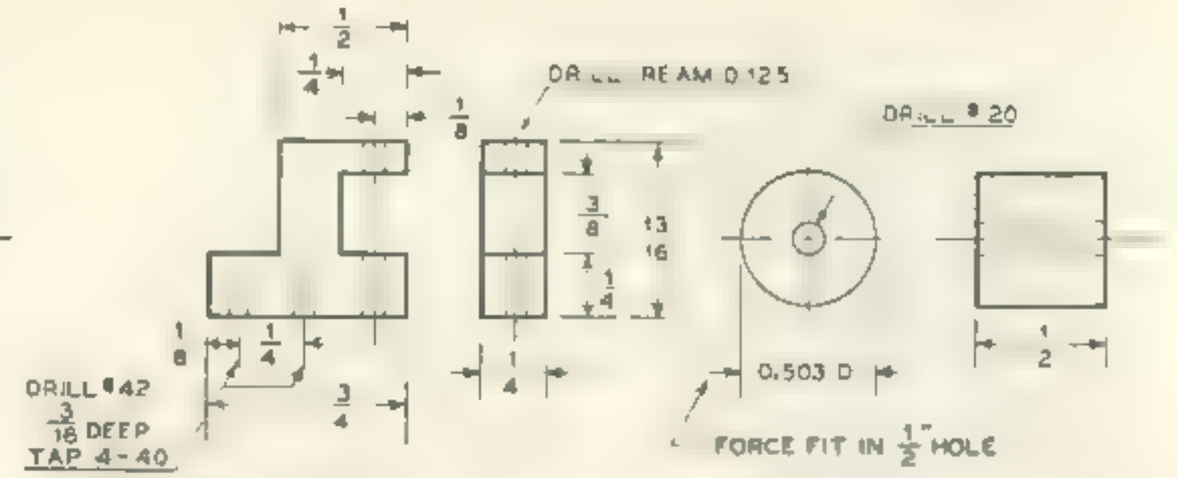


(1) BASE 1 REQ'D NOT TO SAME SCALE
MATERIAL - BRASS OR STEEL
FINISH - DULL BLACK LACQUER



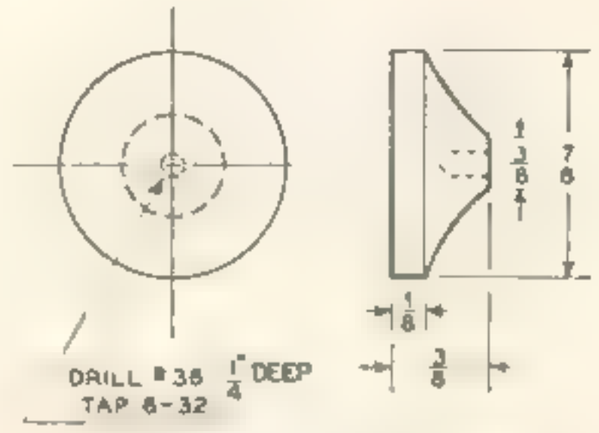
(2) LOCK NUT 4 REQ'D
MATERIAL - BRASS
FINISH - NICKEL PLATE

(3) STUD 4 REQ'D
MATERIAL - 5/16 BRASS HEX ROD
FINISH - NICKEL PLATE

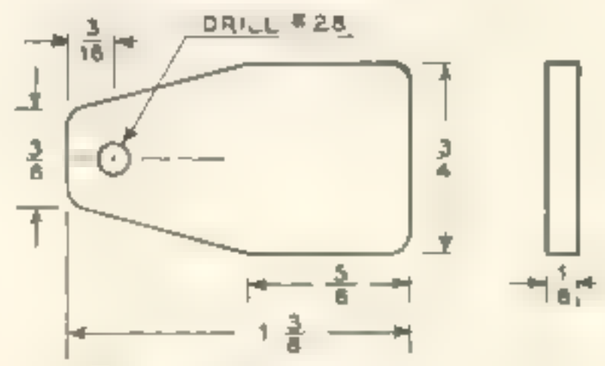


(4) BEARING 1 REQ'D
MATERIAL - BRASS
FINISH - NICKEL PLATE

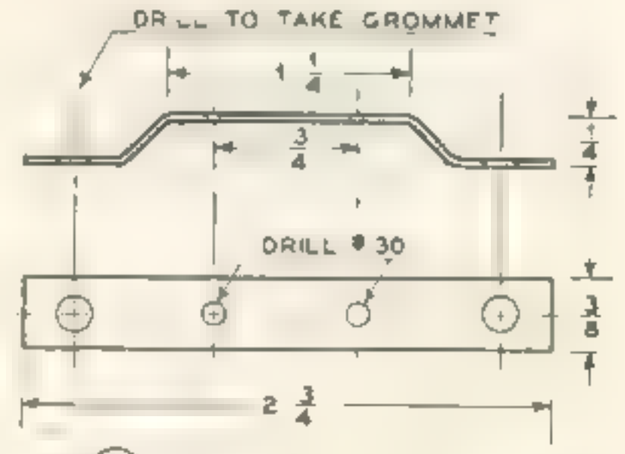
(5) BUSHING 2 REQ'D
MATERIAL - BAKELITE ROD



(11) KNOB 1 REQ'D
MATERIAL - LUCITE
FINISH - POLISH

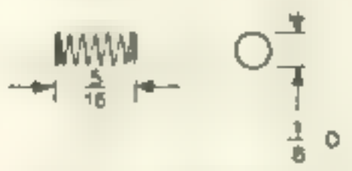


(12) PADDLE 1 REQ'D
MATERIAL - LUCITE
FINISH - POLISH

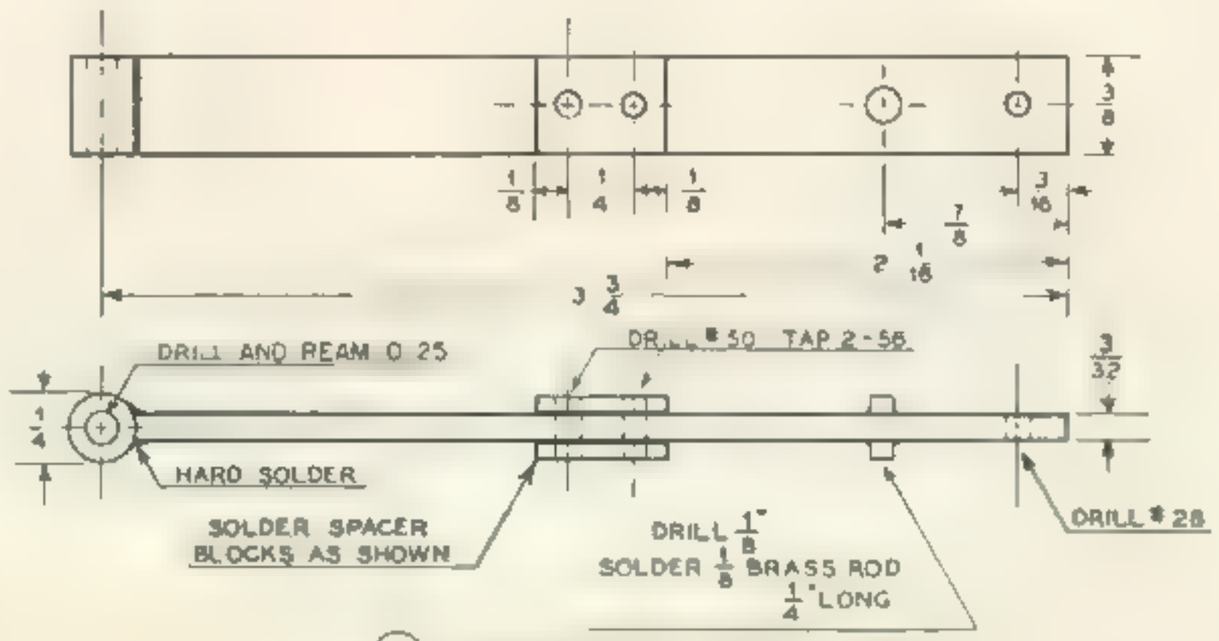


(13) FOOT 2 REQ'D
MATERIAL - 0.050" ALUMINUM

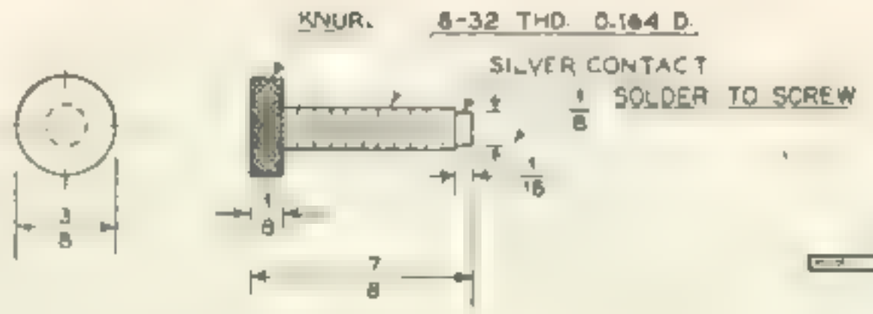
(6) PIN 1 REQ'D
1/8" DIAMETER DRILL ROD



(7) SPRING 2 REQ'D
FREE LENGTH SHOWN
0.012 PHOSPHOR BRONZE OR STEEL WIRE

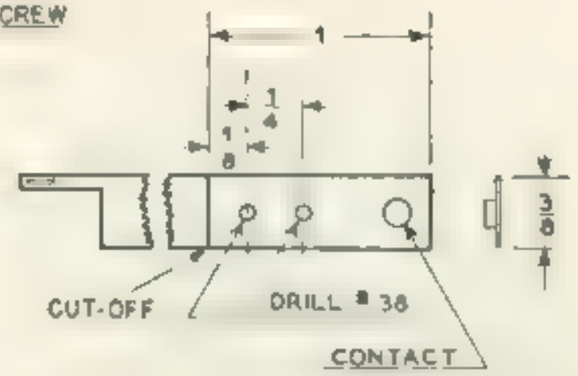


(8) CONTACT BAR 1 REQ'D
MATERIAL - BRASS
FINISH - NICKEL PLATE



(9) CONTACT SCREW 2 REQ'D
MATERIAL - BRASS
FINISH - NICKEL PLATE

(10) TENSION SCREW 2 REQ'D
MADE THE SAME AS 9 EXCEPT OMIT SILVER CONTACTS



(14) CONTACT SPRING 2 REQ'D
CUT FROM RELAY CONTACT SPRING 1" LENGTH

ducts and the relay closes. After a period of time determined by the circuit time constants the relay opens. The cathode coupled multivibrator is in essence a cathode follower, driven by a triode amplifier. The common cathode resistor provides a large amount of feedback, causing the circuit to oscillate and alternately drive each tube to saturation. The flow of plate current interchanges between the tubes at a rate determined by the time constant *R1 C1*.

Since the same time constant is used for both cycles of the action the dot length is made equal to the space. Actually the relay takes a certain amount of current to pull in, but the hold-in current is less, so that normally the relay will hold in longer than it stays open. By providing for adjustment of the common cathode resistor, the feedback is made variable and consequently the lengths of dot and space may be made equal to suit the particular relay used. Once this initial adjustment has been made the speed may be changed by varying *R1*, and the ratio of dot to space will remain constant. It is important that the feedback or drive condenser *C1* be connected on the power supply side of the relay, or the inductance of the relay will enter into the multivibrator action. In initial experiments this condenser was connected to the tube plate and erratic action and unequal dot-space ratio resulted. The limiting resistor, *R5*, was chosen to give a reasonable range of speeds up to 25 w.p.m.—for faster speeds it should be decreased. The resistor *R2* should be adjusted at normal keying speeds for equal dot and space (or what the individual operator prefers) by means of listening tests or an oscilloscope if available.

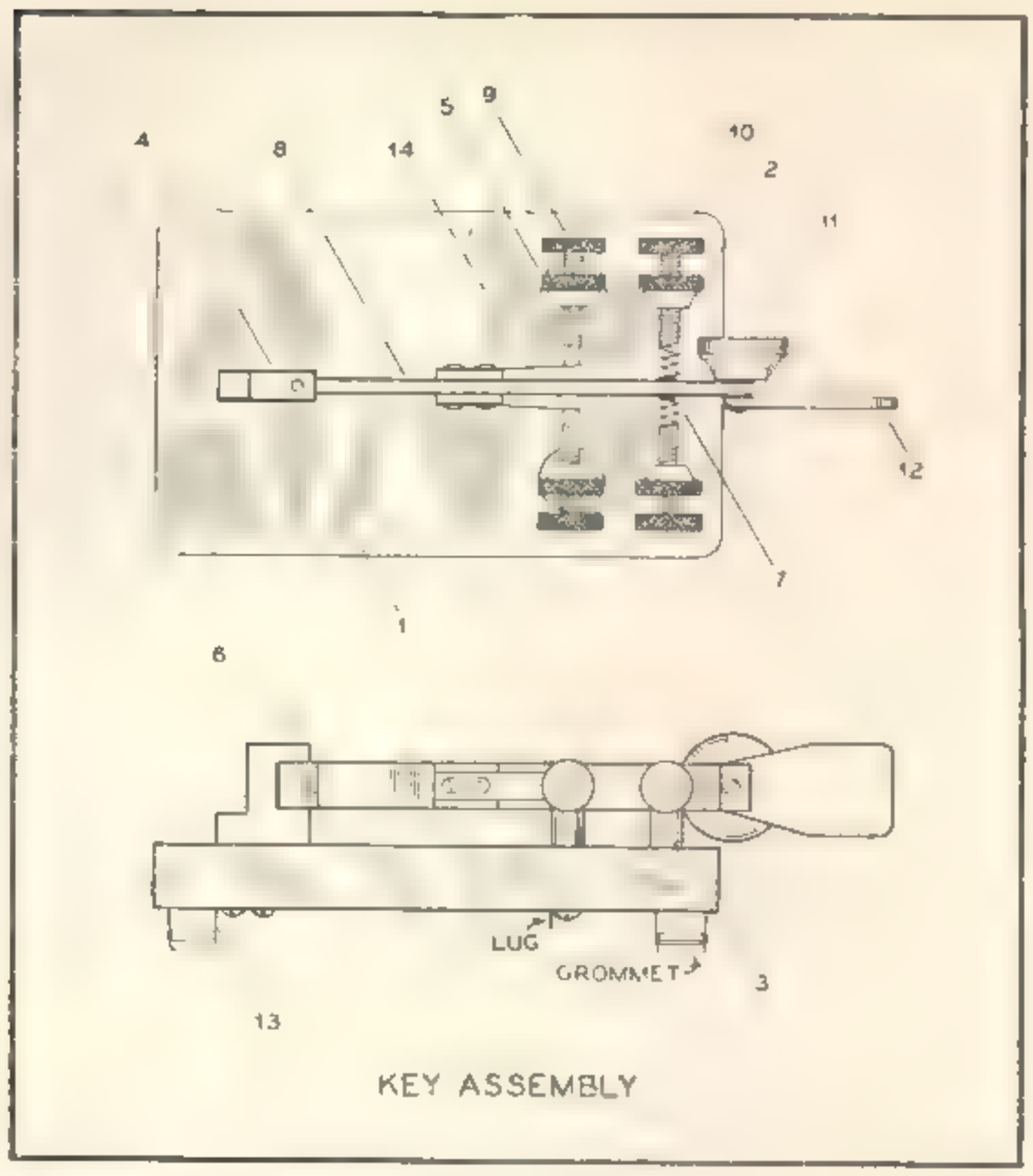
Dashes are keyed manually as with a regular bug, by means of the left contact of the key, which places the relay in series with a limiting resistor, *R3*, across the power supply. The value of the resistor should be made small enough so that the relay closes decisively.

The relay used is of the ordinary telephone type with 5000-ohm coil, and requires 5 ma to close. Other relays closing on 2-10 ma can be used successfully. Contact arrangement can be varied to suit individual needs. At our station provision is made for keying the transmitter, a keying monitor, and receiver disabling circuit for break-in. Most telephone relays have enough contacts to provide any control you may desire.

The keying circuit was built into the v-f-o chassis where the speed control is convenient. The unit should not be used on the regulated branch of a supply used for v-f-o operation, as high peak currents are drawn on part of the keying cycle which will cause chirp in the v.f.o.

Machining the Key

The key used with the circuit is shown in the photograph, and was built with machine tool facilities, although the average junk box will provide adequate stock for its construction with minor changes.[3] Drawings are included for those who desire complete dimensions. The base is a large brass (or steel) plate of sufficient weight to prevent "walking" when provided with rubber feet. Bakelite inserts



KEY ASSEMBLY

Numbers on individual parts of the key refer to the detail drawings on the facing page.

were turned on a lathe to drive into holes in the block and provide insulation for the stationary contacts. The contacts as well as the tension springs are fastened to the base at appropriate places with machine screws and lugs provided for connections. The center arm carrying the handle and contacts is hinged at the back by a bearing which is tapped to take screws through the base. This bearing should be made fairly snug since it carries the weight of the arm and should not be loose in the vertical plane. Adjustments are provided for spring tension and contact spacing by screws with lock nuts. Contacts on both stationary and movable parts were salvaged from spare relay contact springs. A coat of dull black enamel and a set of lucite grips give the unit a finished appearance.

The model key has been in use for over a year and no adjustments have been necessary other than to keep the relay contacts clean. In operation it handles like a bug, although you will miss the swing of the weights for a while. The key tension may be adjusted to suit individual preference. In general it may be less than normally used on a bug, thus reducing fatigue. The extension of the circuit for fully automatic operation should be apparent. It requires the duplication of the circuit for dashes, using a longer time constant for *R1 C1*. The left key contact is then used to actuate the dash multivibrator.

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[3] Actual construction can be further simplified by substituting wherever possible automatic key replacement parts available from most manufacturers of bugs. Les Logan Co., a division of E. F. Johnson Co., and The Vibroplex Company both have available a complete assortment of all automatic key components.

The Other Fellow's Station-W3OR

When it comes to 6-meter activity, consistency and results are the by-words for Alan S. Vincent, W3OR. A ham since 1926, Alan is more often than not the 50-mc bands only representative in eastern Pennsylvania.

Located in Essington, Pa., about 15 miles southwest of the center of Philadelphia, W3OR was the first W3 to reach into G and PAØ during the recent outburst of 6-meter DX. Alan also leads in the total number of states worked on 6 meters from the third call area.

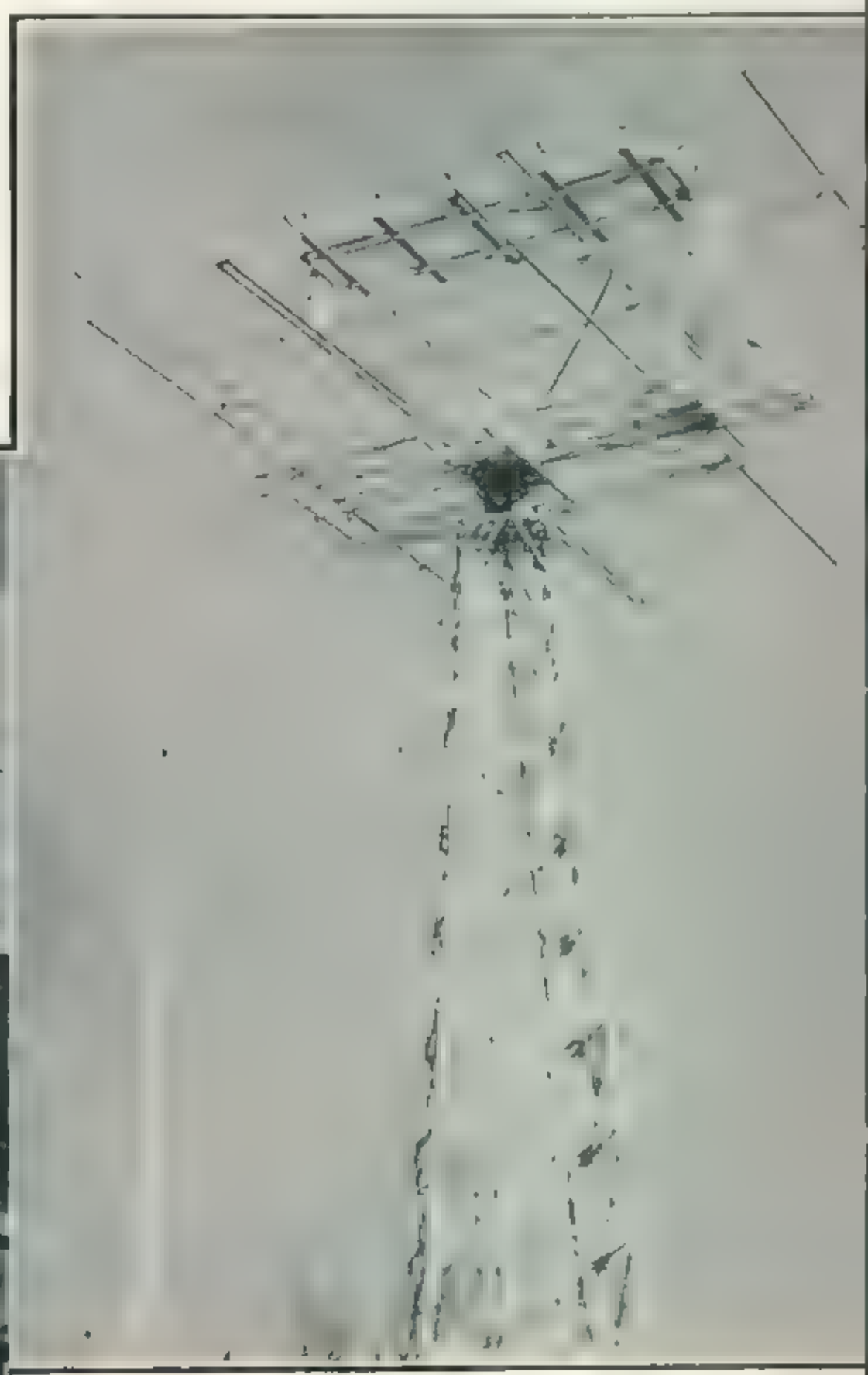
Considerable time and forethought went into the construction of the tower and beam antennas at W3OR, one of the outstanding features of the station. Actually, one year (1940–41) was required to assemble the entire array. The original plans called for a four-element 5-meter beam which could be rotated for either horizontal or vertical polarization. Revised frequency allocations after the war and the desire to operate with beam antennas on other bands necessitated the design of the new composite arrays which are pictured. The tower is atop a two and one-half story house making the over-all height of the two-meter beam 56 feet above ground level.

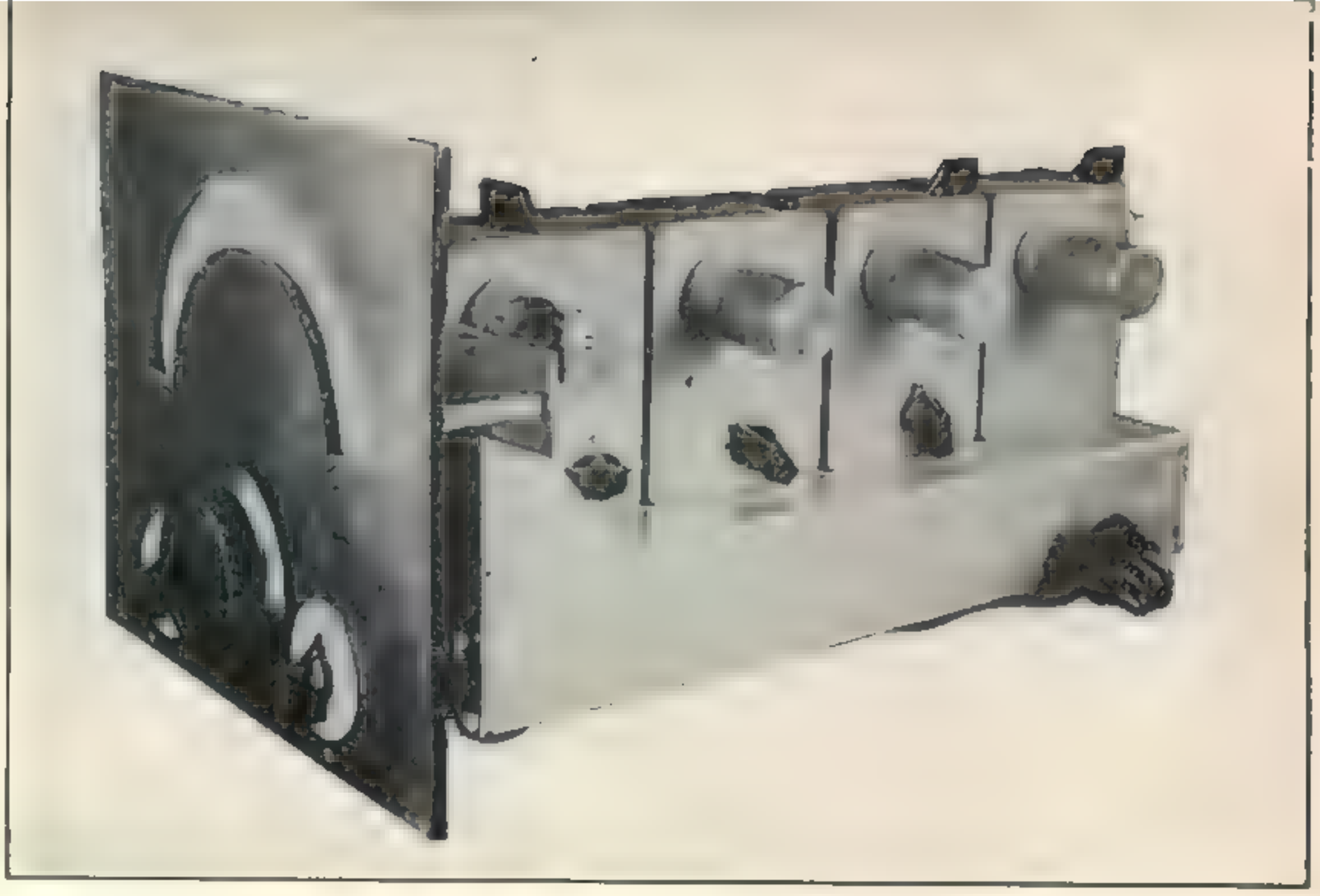
The rotating head is a Mims with Selsyn motors to indicate the position of beam. The bottom beam is for 10 meters and consists of a three-element closed-spaced array with a folded dipole with a 1:1 ratio as the driven element. The middle beam is for 6 meters and is a four-element array using full quarter-wave spacing. The driven element is another folded dipole with a 1:1 ratio. It is fed with RG8/U through a quarter wave re-entrant transformer. The uppermost beam is the old 5-meter band beam converted to a four-element quarter-wave array for 2 meters. It is also a folded dipole fed through a reentrant transformer from RG8/U. This beam may be rotated from horizontal to vertical polarization by a series motor through reduction gears and a 90° angle gear. Limit switch automatically locks the beam into either polarization from a single control at the operating position. The elements on all the beams ar one-inch O.D. aluminum tubing.

The two transmitters shown in the background ar always ready to go on either 10 or 6 meters. Th 10-meter transmitter is a National 600 which i e-c-o controlled by a Meissner Signal Shifter. Th 6-meter transmitter is controlled by the high stabil ity RCA master oscillator directly in front of th operating position. The master oscillator drives a ARC-5 T23, into a single 35T, driving a pair o GL-592s running 800 watts input. Both transmitte use the same modulating equipment and are rela controlled in such a fashion that it takes less tha three seconds to go from one band to the other. Th 2-meter transmitter is an ARC-5 modulated by th NTE unit in the National 600 transmitter.

For 6-meter work a Lester converter into a HRO receiver is used. An NHU is also used on thi band and on 10–11 meters, while a National 1–1 and SCR-522 serve on 2 meters. Not visible in th photos are rotary beam controls, great circle map frequency standard and modulation indicator.

W3OR is 45 years old, married, and has fo another hobby a 28′ cabin cruiser. When not hold ing down his job in the Westinghouse researc laboratory, or going full blast on 6, Alan can prob ably be found on his yacht. Needless to say i carries complete radio facilities and most of W3OR' 2-meter mobile work is from the SUNDAY-GA (Photo by W3GSX, Ray McCracken)





ront and right-hand side of the G5BY to 6-meter converter. The front panel ontrols are first r-f stage trimmer and ntenna coupling. The four isolation oxes are (from the front panel): oscil- ator, mixer, second r-f stage, and first -f stage. The controls on the sides of oxes are for trimming the individual tages in the tuning-up process. The 0-way plug connects the converter to the 1600 kc i-f channel.

◆ ◆ ◆

6-Meter DX Man's Converter

HILTON L. O'HEFFERNAN, G5BY*

Long an outstanding figure in international v-h-f work, much of G5BY's success is credited to this hot converter.

THIS CONVERTER was designed specifically to outperform both of the quite successful acorn-type onverters that had been used by the writer on the 0 to 54-mc and 58.5 to 60-mc bands. Certain eatures—such as ease of trimming each stage without having to delve into the interior, ability to vary he antenna coupling from the front panel, together ith similar front panel control of the first r-f stage immer—were considered essential in view of the xperience gained with the other two converters. rovision was also made to enable either transformer r capacitive coupling between stages.

The output of the converter was to feed into a ommon i-f channel of 1600 kc. The tubes to be used ere Mullard EF54 and EC52. The former is a igh-gain broad-band pentode. The latter is a triode. Data on these tubes and their American equivalents re given in the appendix.

he Circuit

The design of the LC is based upon the unbalanced plit-stator circuit developed by the Hallicrafters Co. t is intended, of course, for wide tuning range reivers. It offered, nevertheless, the worthwhile dvantage of keeping the sensitivity equal throughut the entire tuning range which even in a strictly ne-band converter can differ somewhat when the C ratio decreases at the l-f end ofthe tuning range.

In the unbalanced split-stator circuit the maxium capacity of the stator section next to the grid the tube is one-fourth that of the maximum of e other section. Therefore, approximately one-half of the voltage developed when the circuit is tuned to the high-frequency end of the band will be applied to the grid of the tube. This is in contrast to the normal r-f stage, where the gain would be greatest at the high-frequency end of the tuning spectrum. The reduction is obtained since at the minimum setting of the two capacitor sections the capacity would be equal. When the LC is tuned to the low-frequency end there is a 4-to-1 capacity difference between the two sections and, as the r-f voltage applied to the tube is a function of the reactance across which the tube input circuit is connected, approximately 4/5 of the total r-f voltage is applied to the grid of the tube. While inductive reactance at a given frequency increases as the value of the inductance itself increases, capacitive reactance increases as the capacity is decreased, therefore, connecting the tube input circuit across 1/5 of the capacity in the circuit has the same effect as tapping it across 4/5 of the coil.

Otherwise, this circuit follows standard engineering practices. Experience with the British EF54 as a mixer has shown that the best signal-to-noise ratio was obtained—at the expense of some gain—when using screen grid injection. This method has been employed in this circuit and proven to be very satisfactory. The oscillator is the common tickler type with an adjustment for regulating the coupling between the two coils and hence alter the amount of injection to the mixer.

The Construction

The original layout was made through the use of full-scale drawings. Although this involved spend-

Rest Haven Hotel, Thurlestone, South Devon, Great itain

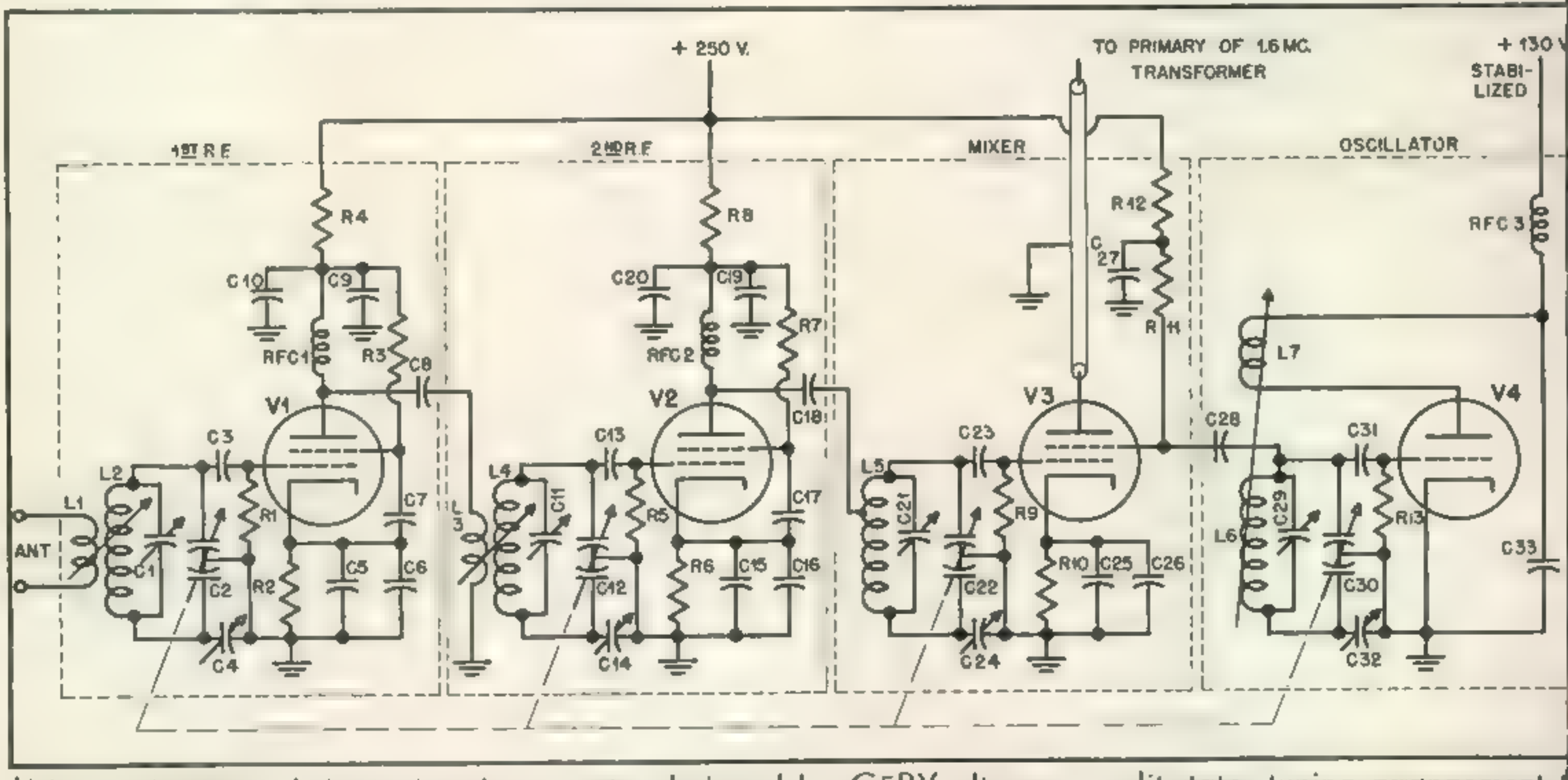
ing considerable time it has enabled us to achieve a converter which worked satisfactorily from the first moment it was tested. The mechanical layout may be seen in the accompanying photographs. Each r-f stage, as well as the mixer and oscillator, is contained in a separate die-cast shielding box. These are a standard line, obtainable in the English market for about $1 each. Additional isolation between the input and output circuits in each stage is obtained through the use of a homemade screen of #22 gauge aluminum running right across the center of the tube socket. All components associated with the plate and screen circuits are located in the right-hand compartment thus formed, together with the 6.3-volt heater and d-c supply leads.

These isolation boxes are used for screening or shield purposes only, and are not allowed to carry any ground return currents. All of the tuning and trimming condensers are insulated from the boxes and the leads run from the ground sides direct to one common point (actually the screw holding the tube socket in place). An insulated flexible shaft coupling is used between each of the ganged tuning condensers. It will be found that attention to these small details often makes the small difference between a converter that really performs and another—using the identical circuit—that merely "works" in the common sense of the word.

The four main tuning condensers were standard 25-25 $\mu\mu$f split-stator jobs and to secure the 4-to- capacity difference two of the three stator plate were removed from that section which would b connected to the grid of the tube. In the case of th condensers to be used in the two r-f stages, the re maining stator plate left was on the outside of th rotor plates, so that it meshed with only one roto plate. For use in the oscillator stage the stator plat left was one that meshed between two rotor plates this giving the necessary extra capacity for tunin the oscillator on the low-frequency side of the signa

15-$\mu\mu$f trimmer condensers (*C4, C14, C24, C32* are connected between the free end of the tunin coils and ground. This gives a range of about tw megacycles. In the isolation boxes they are locate immediately below the split-stator tuning condense Those trimmers in the second r-f stage, mixer an oscillator stages are adjusted from the sides of th boxes (small knobs beneath the tubes) while the firs r-f stage is trimmed from the front panel through a extension shaft. A Millen bevel gear is used for thi purpose.

3–30 $\mu\mu$f air trimmers (*C1, C11, C21, C29*) ar connected across the coil of each stage. These wer employed initially as a temporary measure to hel in lining up the circuits without spending a lot c time in coil pruning. However, when the converte



Wiring schematic of the high-gain converter designed by G5BY. It uses a split-stator tuning arrangement equalize the over-all gain and provide symmetry to the circuit.

C1, C11, C21, C29—3-30 $\mu\mu$f air trimmers (McMurdo Silver).
C2, C12, C22, C30—6 + 25 $\mu\mu$f, special tuning condensers, see text.
C3, C13, C23—100 $\mu\mu$f, ceramic.
C4, C14, C24, C32—15 $\mu\mu$f, variable.
C5, C6, C7, C9, C15, C16, C17, C19, C25, C26, C33—500 $\mu\mu$f, midget mica.
C8, C18, C28, C31—50 $\mu\mu$f, ceramic.
C10, C20, C27—.01 μf, tubular.
R1, R5, C9—330 K.
R2, R6—140 ohms.
R3, R7—1 K.
R4, R8—2 K.
R10, R12—4.7 K.
R11—220 K.
R13—47 K.
All resistors are ½ watt.
RFC1, RFC2, RFC3—5.6 microhenries.
L1—5 turns, ¾" ID, No. 14 (American) tinned copper, length ½".
L2, L4, L5—4 turns, ¾" ID, No. 14 tinned copper, length ¾".
L3—4 turns, ¾" ID, No. 14 tinned copper, length ½"
L5 tapped ¾ turn from gr end.
L6—3 turns, ¾" ID, No. tinned copper, length 1".
L7—3 turns, ¾" ID, No. tinned copper, length 3/8
All inductances originally d signed for 56-60 mc, see tex
V1, V2, V3—Mullard EF54.
V4—Mullard EC52.
1 chassis, 15½" x 6¼" x2¼ see text.
1 panel, 10½" x 9" high.
4 screening boxes, 3½" x 4½ x 2" deep, see text.

The side of the G5BY converter with the sides of the isolation boxes removed to show the location of the coils and tuning condensers. The knobs on the tops of boxes adjust the coupling coils and the antenna primary. The antenna coupling may also be adjusted through a bevel gear and extension through the chassis to the front panel. One section of each of the 25 $\mu\mu f$ split-stator condensers is reduced to one stator plate to obtain the desired 4-to-1 unbalanced condition described in the text. Tube shown is a voltage regulator.

was put in service in the 56 to 60-mc band during the summer of 1947 it worked so well (12 countries worked) that its use for the Fall F2-layer DX season was indicated. Not wishing to disturb the carefully pruned coils any further, the 50-mc band was located by compressing each trimmer to about 20–25 $\mu\mu f$. This gave coverage of from 50 to 53 mc which is, of course, the most frequently used portion of the band. For exclusive 50-mc operation it is recommended that the inductance of the coils be increased slightly with *C1*, etc., near minimum and *C4*, etc., about half scale. This will enable the full band from 50 to 54 mc to be covered. In any case, even this small loss of inductance still enabled the writer to read weak signals which absolutely could not be heard on the acorn converter.

One-quarter inch polystyrene rods mounted vertically through the isolation boxes are used to vary the coupling between the coils. In the first r-f stage variation of the antenna coupling is obtained by the right-hand front panel control. It is also adjustable by the knob on the top of the r-f stage isolation box. The knob on the top of the second r-f stage varies the interstage coupling. Capacity coupling having proved successful between this stage and the mixer no coupling control is used. On the top of the oscillator compartment the knob varies the amount of injection into the mixer for the best signal-to-noise ratio.

The tuning coils are soldered directly to the split-stator condenser and the length of the grid leads is just that of the 100-$\mu\mu f$ ceramic condensers (*C3*, *C13*, *C23*). The coupling and interstage coils are attached to the polystyrene rods by means of bolts and nuts which pass through clearance holes drilled into the rods. The leads to the antenna primary should be of stranded insulated wire to permit constant movement without breakage. The other primaries can employ thin solid wire, since these are generally adjusted only during the initial tuning-up process. The polystyrene rod from the antenna coupling coil passes through the top of the chassis into another Millen bevel gear and out to the front panel. The controls visible at the rear of the chassis are for the insertion of a milliammeter to read the plate currents of the individual r-f stages.

Performance

Both of the r-f stages are designed to work what we call "flat-out," or maximum gain. Therefore, we use the maximum permissible plate and screen voltages; together with the minimum of cathode resistance. The EF54 having four cathode pins necessitates two bypass condensers per stage (*C5*, *C6*, etc.). The returns are all brought out to a common ground. It is impossible to produce any trace of self-sustained oscillation with both r-f stages exactly in tune, no matter how loosely the antenna be coupled. Without the antenna connected there is some evidence of oscillation at certain frequencies, but even this occurs only at the maximum plate and screen voltages. This degree of stability is probably due to the care taken in the shielding of the stages and the efficient bypassing. The operation is not critical and the performance is constant over long periods of time. Should the converter provide too much gain, the mixer stage may be detuned through *C24*.

One of the greatest improvements over the acorn converter was the freedom from drift. Once the tube elements themselves have assumed their normal operating temperature, no further perceptible change in calibration takes place. Even from a very cold start the total drift must be measured in cycles. The calibration has remained excellent over a six to seven-month period.

Using the converter during the October and November, 1947, periods of high MUF, a total of 135 DX amateur stations were received in the 50-mc band. These comprised four South Africans, one Egyptian and one from the Suez Canal (all on phone); the remaining 129 being located in the United States and Canada. All American districts, except the 7th, and at least 25 States were heard and identified. 175 two-way 6-meter contacts were made between November 6 and December 1, 1947. Harmonics in the 50-mc band were received from commercials in South America and Asia. Australasia was the only continent from which no 50-mc signals could be positively identified.

Appendix

The EF54, also known as the RL7 does not have an exact American equivalent. The tube, although as large as some of the American octal metal envelopes, is designed particularly for operation as an r-f amplifier up to 250 megacycles. The base is nine pins of the lock-in type. The main characteristics

(*Continued on page 90*)

FEEDING THE BEAM

With Inductively Coupled Loops

HARRY E. STEWART, W7KJR*

A complete development of the theory of inductively coupled loops and practical data for their application.

MANY METHODS have been devised for feeding rotatable, parasitic arrays (or beams, as they are commonly referred to). Some methods permit continuous rotation by means of slip rings while others can be only rotated 360°, or less, in one direction and are then reversed to prevent winding the transmission lines about the supporting structures. Inductive coupling, between the driven element and the transmission line, has been used to a certain extent, but it has not enjoyed the popularity it deserves. The author feels that this method of feeding a beam has been largely slighted because of the scarcity of available design data. The aims of the present article are, therefore, twofold: (1) supply the necessary data for designing an inductively coupled loop system; and (2), discuss the theory of inductive coupling, as applied to antennas, and show how this method can be used as an impedance transforming device.

The driven element of a parasitic array can be inductively coupled to its transmission line by means of two single turn loops, as shown in *Figs. 1a* and *3*. The loops are coaxial with the vertical shaft (or axis) on which the antenna system rotates, and are spaced about ½" to 1½" apart. Such an arrangement permits continuous rotation of the antenna without the use of collector rings or rotating joint. The two loops should be constructed from copper tubing or strap, so they will have low r-f resistance

The generally accepted figures for the feed impedance of an array using parasitic elements are the basis for the examples given throughout this article. However, in individual cases it is relatively simple to determine the actual *feed impedance of the beam. Disconnect the feeder and connect a transmission line of any known impedance (72-ohm coax, 300-ohm twin lead, etc.) to the feed point of the beam. Determine the standing wave ratio existing on this line of known impedance. The SWR is divided into the line impedance and the quotient is the feed impedance of your beam.*

and will be rigid and mechanically strong. They should be mounted to the antenna boom or frame and the stationary pedestal by means of high quality standoff insulators. The spacing between the loops should remain constant as the antenna is rotated, so the mutual inductance between them will not vary, regardless of the position of the antenna. If this is not the case, the antenna system will be detuned with rotation. An inductive loop system not only permits continuous rotation of the antenna array, but also provides an efficient impedance matching device that will transform the low impedance of a parasitic array into one of higher value that will match that of an open-wire or twin-lead type transmission line.

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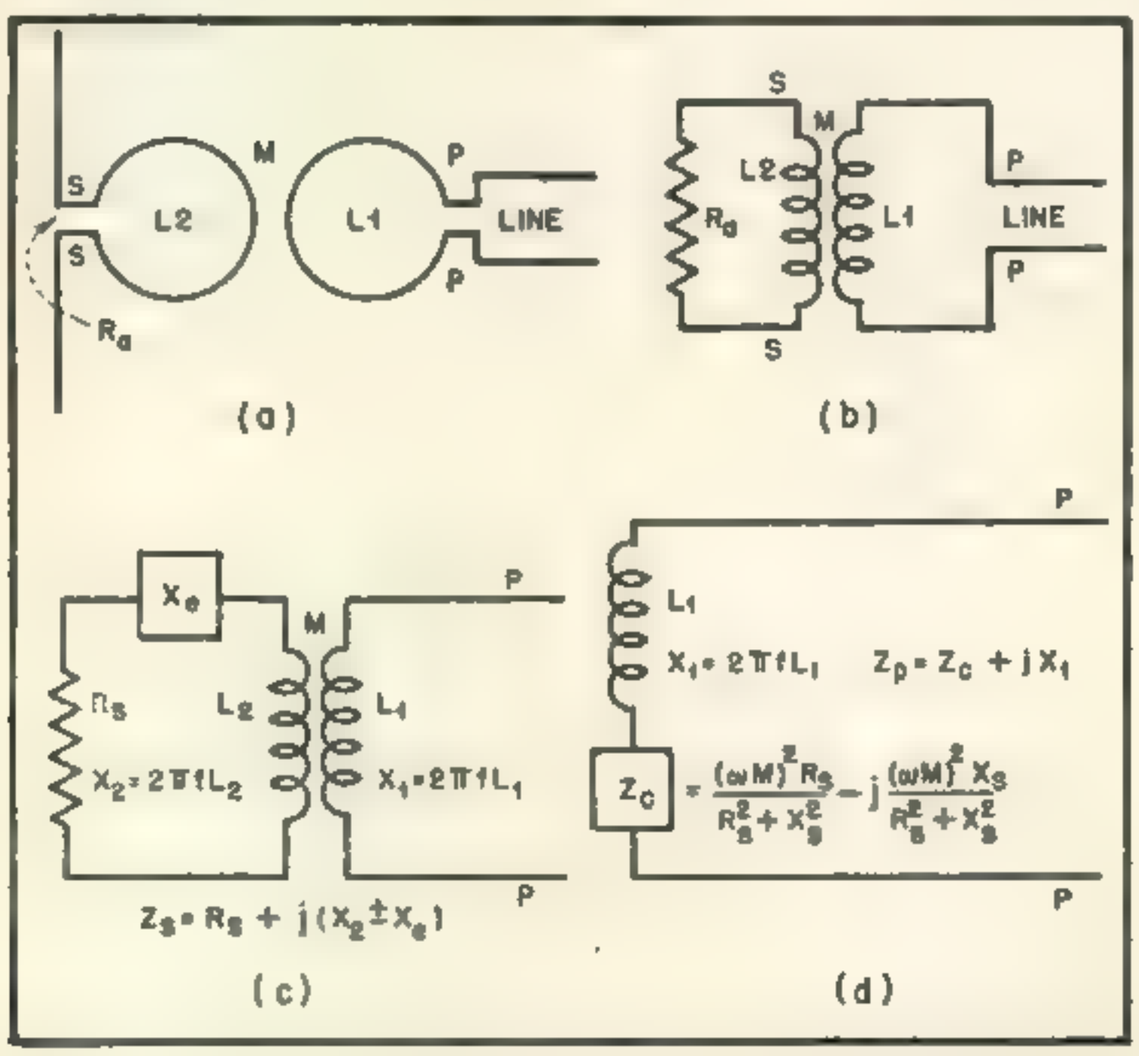


Fig. 1. (a) Driven dipole and loops. (b) Equivalent circuit of a. (c) Inductively coupled circuit. (d) Equivalent circuit of c.

Fundamental Theory (Section 2)

A brief review of the theory of inductively coupled circuits will be of aid in understanding the principle of the loop system. Consider the inductively coupled circuit of *Fig. 1c* where:

L_1 and L_2 are respectively the inductances of the primary and secondary windings (or loops) considered by themselves, in henries.

X_1 and X_2 are respectively equal to $2\pi f L_1$ and $2\pi f L_2$.

M is the mutual inductance between L_1 and L_2, in henries.

$\omega M = 2\pi f M$, the mutual reactance in ohms.

X_e is any external reactance connected in series with the secondary circuit.

R_s is the total resistance in the secondary circuit; in this instance R_s equals R_a, the antenna resistance.

X_s is the total reactance in the secondary circuit, i.e., $X_s = jX_2 \pm jX_e$.

Z_s is the total impedance of the secondary

circuit considered by itself, and is equal to $R_s + jX_s$.

The secondary circuit of *Fig. 1c* will couple an impedance into the primary circuit and will impose a load on that circuit. The impedance coupled into the primary circuit is given by the expression:

$$Z_c = R_c + jX_c = \frac{(\omega M)^2 R_s}{R_s^2 + X_s^2} - j\frac{(\omega M)^2 X_s}{R_s^2 + X_s^2} \quad (1)$$

where R_c and X_c are respectively the resistive and the reactive components of the coupled impedance Z_c. The circuit of *1c* can be simplified to that of *1d*, in which the entire secondary circuit has been replaced with Z_c connected in series with the primary circuit. The problem has been reduced to a relatively simple one involving only the solution of the simple series circuit of *Fig. 1d*.

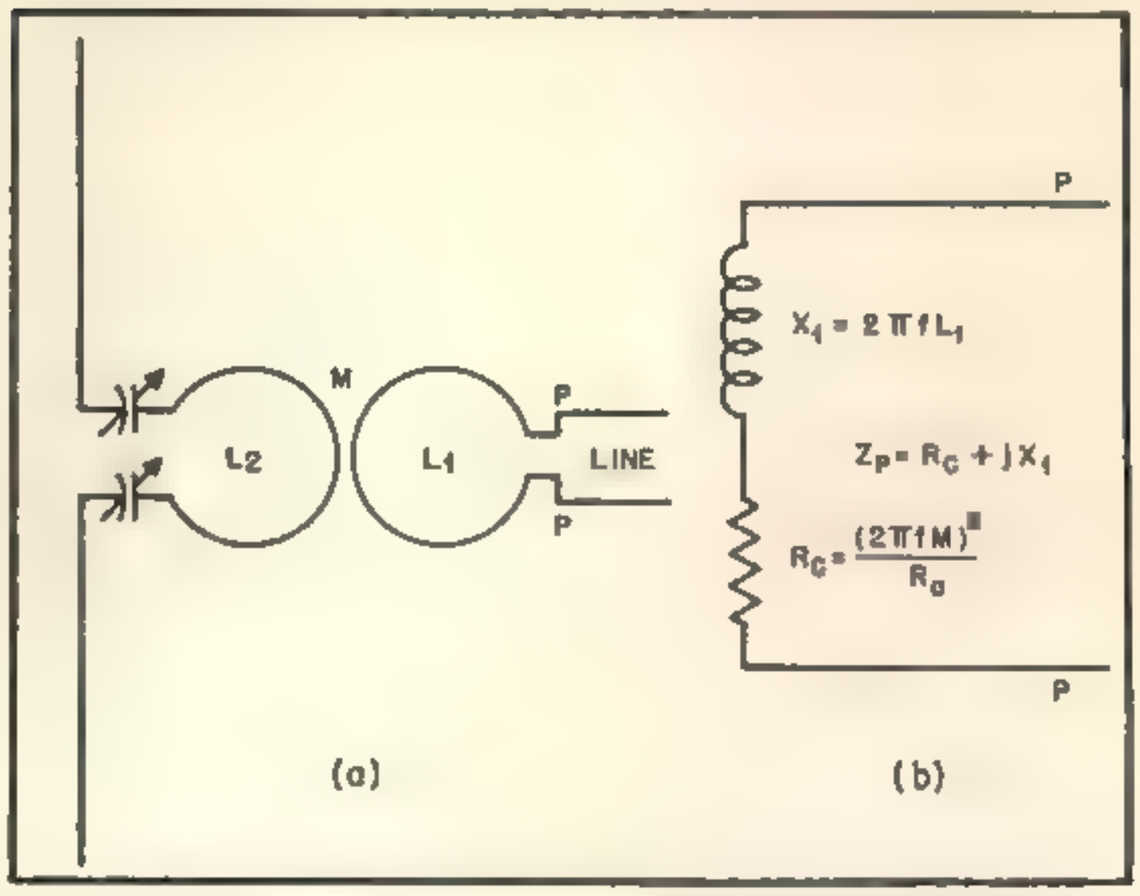


Fig. 2. (a) Condensers are used to resonate inductance, L_2, of secondary loop. An alternate method is to shorten driven element until its reactance equals that of loop L_2. (b) Equivalent series circuit of *a* when secondary circuit is tuned to series resonance.

Z_c can be separated into its components,

$$R_c = \frac{(\omega M)^2 R_s}{R_s^2 + X_s^2} \quad (2)$$

and

$$X_c = -j\frac{(\omega M)^2 X_s}{R_s^2 + X_s^2} \quad (3)$$

Observe that X_c has a sign opposite to that of X_s. This means that an inductive reactance in the secondary circuit is coupled into the primary as a capacitive reactance; and a capacitive reactance, as an inductive reactance. If the secondary circuit is resonated by making X_c of *Fig. 1c* equal in magnitude and opposite in sign to X_2, the coupled reactance X_c becomes zero, since the X_s term of equation (3) is zero under this condition.

Substituting a value of zero for X_s in equation (2), the expression for R_c reduces to:

$$R_c = \frac{(\omega M)^2 R_s}{R_s^2} = \frac{(\omega M)^2}{R_s} = \frac{(2\pi f M)^2}{R_s} \quad (4)$$

It is seen from equation (4), that the value of resistance, R_c, coupled into the primary circuit varies directly as the mutual inductance, M, and the frequency, f, squared, and inversely as the total resistance R_s of the secondary circuit.

Returning to the antenna circuit of *Figs. 1a* and *2a*, it is possible to resonate the secondary circuit (i.e., the antenna and the loop L_2), and reduce the problem to the series circuit of *Fig. 2b*, either by installing a condenser (or condensers) in series with the driven element and the loop L_2, as shown in *Fig. 2a*, or by shortening the driven element until its self-reactance (capacitive) is exactly equal to the inductive reactance of the loop L_2. (The relative merits of these two systems of tuning are discussed in a later section.) At secondary resonance, the impedance across the primary circuit of *Fig. 2b*, which is the impedance that will be presented to the transmission line, is given by the expression

$$Z_p = R_c + jX_1 = \frac{(\omega M)^2}{R_a} + jX_1 \quad (5)$$

where R_a is the resistance of the antenna. An impedance match between Z_p and the characteristic impedance of the transmission line can be easily

Beam Tuning Procedure

1. Adjust directors and reflector to their approximate lengths.
2. Resonate driven element and secondary loop circuit, using one of the methods discussed in Section 8 and illustrated in Figure 8.
3. Energize antenna array by connecting transmission line to primary loop terminals, as shown in Figures 7 and 8b, then adjust lengths of directors and reflector to give either maximum forward radiation or minimum backward radiation, depending upon the individual's choice.
4. Repeat steps 2 and 3, since parasitic elements are not resonant elements, and they therefore reflect reactances into the driven element circuit and into each other, thereby affecting the tuning of the entire array.
5. Examine standing waves on transmission line; determine positions and values of I_{min} and I_{min}, and compute SWR.

Impedance Matching by Corrective Stub or Reactance

6a. Connect corrective stub or reactance across transmission line at distance X from I_{min}, as discussed in Section 6 and illustrated in Figure 7.

7a. Move stub or reactance back and forth along the line and set at position giving minimum value of SWR; then vary tuning of stub or reactance to minimize SWR. Repeat these two procedures until SWR is a minimum. Beam should now be properly tuned.

Impedance Matching By Mutual Inductance

6b. Vary loop spacing (i.e., M) and determine whether M has to be increased or decreased to reduce value of SWR. Minimize SWR by this adjustment. (See Section 7)

7b. If step 6b yields an SWR of sufficiently low value, the beam is tuned; otherwise, a capacitive reactance should be used, as discussed in Section 7, to reduce further the value of SWR by tuning out the primary loop reactance.

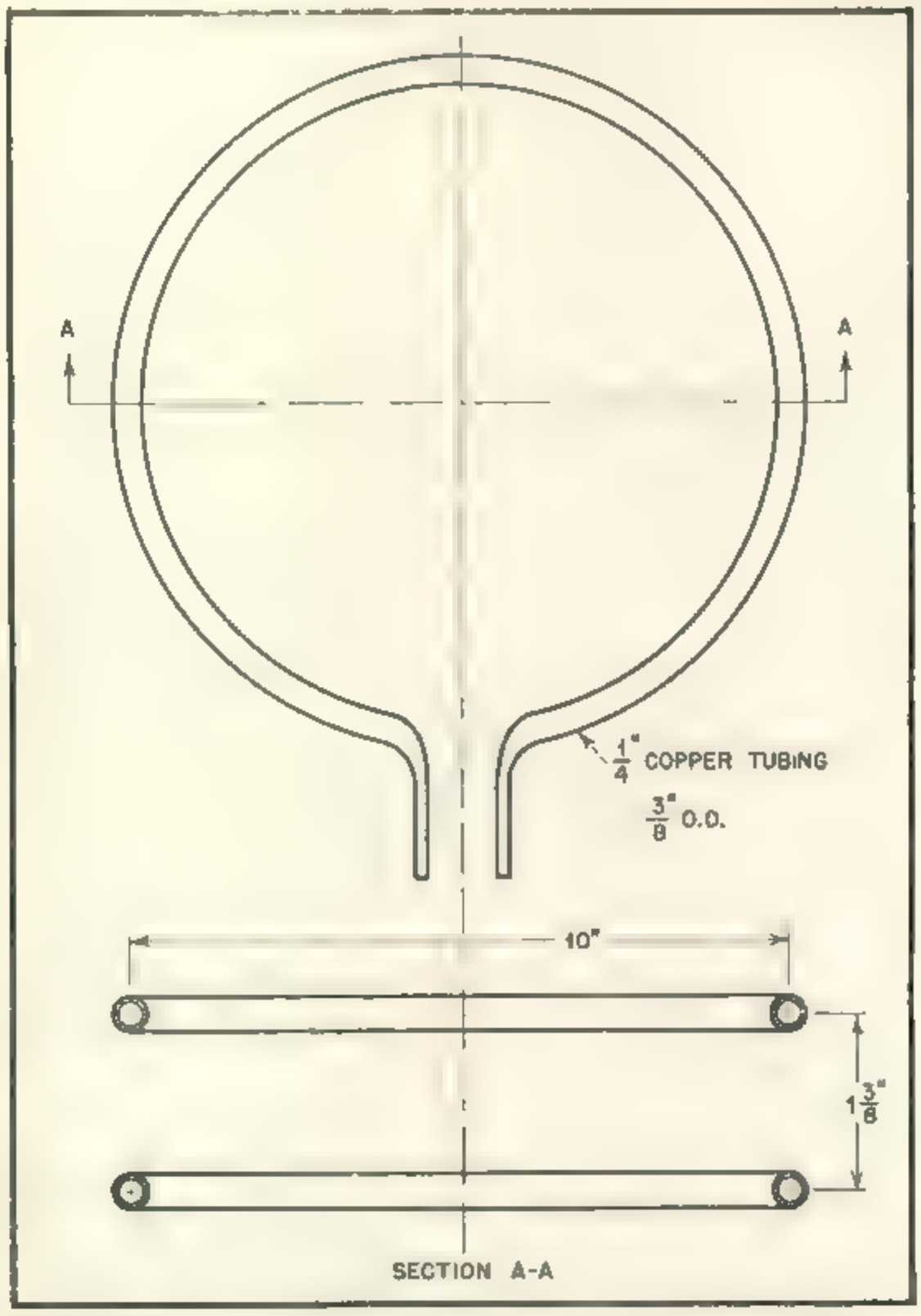


Fig. 3. Dimensions and construction of typical inductive loops.

effected by using corrective stubs or corrective reactances (*Section 6*) or by proper selection of mutual inductance, *M* (*Section 8*).

Sizes and Properties of Loops L_1 and L_2 (Section 3)

In order to analyze any particular problem, the loop inductances, L_1 and L_2, and the mutual inductance, M, must be known. In case the two loops are identical, L_1 and L_2 are equal. It is possible to calculate, with a fair degree of accuracy, the inductance of a single turn loop by means of the following expression[1]:

$$L = .03193\, a\, (2.303\, Log_{10} \frac{16a}{d} - 2) \qquad (6)$$

where L is the inductance in microhenries; a i the mean radius of the coil in inches; and d is th outside diameter, in inches, of the conductor fron which the coil is fashioned. As an example, con sider the loop system of *Fig. 3*, in which the loop are constructed from 1/4" copper tubing (o.d. = 3/8"). They have a mean loop diameter of 10" an are spaced 1 3/8" between centers. Substitutin these dimensions into equation (6):

$$L = (.03193 \times 5'') (2.303\, Log_{10} \frac{16 \times 5''}{.375''} - 2)$$

$$L = .1597\, (2.303\, Log_{10} 213 - 2)$$

$$= .1597\, (5.36 - 2) = .1597 \times 3.36$$

$$= .537 \text{ microhenries}$$

To illustrate the accuracy of (6), the loop systen of *Fig. 3* was measured with an r-f impedance bridge at a frequency of 28.85 mc, and the following data were obtained:

$$L_1 = L_2 = .557\ \mu h$$

$$X_1 = X_2 = +j101 \text{ ohms}$$

$$M = .240\ \mu h$$

$$M = 2\pi fM = 43.6 \text{ ohms}$$

$$\text{Coefficient of coupling} = .431$$

The calculated value of inductance checks withi 4% of that measured by the bridge; the discrepanc could be attributed to the bridge since its accurac is limited to 3 or 4 per cent.

The mutual inductance, M, can also be computed to a similar degree of accuracy by means of th following expression, from Circular 74,

$$M = 2.54\, Fa \qquad (7)$$

where F is given by the curve of *Fig. 4*, and th ratio $\frac{r_2}{r_1}$ is given by the expression

$$\frac{r_2}{r_1} = \frac{r_2}{\sqrt{r_2^2 + 4a^2}} \qquad (8$$

where r_1, r_2, and a are all in inches and represen the dimensions shown in the sketch of *Fig. 4*. Equa

[1] Bureau of Standards Circular 74: The expressio has been modified to accommodate dimensions i inches instead of centimeters.

TABLE I

Type of Antenna	4-Element Beam		3-Element Beam		2-Element Beam	
Frequency in megacycle	14.20	28.85	14.20	28.85	14.20	28.85
Loop Inductance $L_1 = L_2$ μh	.557	.557	.557	.557	.557	.557
Mutual Inductance M μh	.240	.240	.240	.240	.240	.240
$\omega M + 2\pi fM$ (ohms)	21.4	43.6	21.4	43 6	21.4	43.6
Antenna Resistance ($R_a = R_a$)	6	6	8	8	14	14
Loop Reactance $= 2\pi fl_1$	$+j50$	$+j101$	$+j50$	$+j101$	$+j50$	$+j101$
Primary Imped. Z_p (ohms)	$76+j50$	$317+j101$	$57+j50$	$237+j101$	$35+j50$	$146+j101$
Trans. Line Imped. Z_t ohms	600	600	600	600	600	600
S W R—Equation (9)	8.1	1.97	10.6	2.61	17.2	4.23
Dist. X in Wavelength (1)	.197	.152	.203	.162	.212	.179
Closed-Stub length in λ (2)	.061	.153	.053	.125	.041	.091
Open-Stub length in λ (3)	.189	.097	.197	.125	.209	.159
Reactance of Stubs Ohms (4)	$\pm j245$	$\pm j860$	$\pm j205$	$\pm j600$	$\pm j155$	$\pm j390$
Inductance L in μh	2.75	4.75	2.3	3.31	1.74	2.15
Capacitance C in $\mu\mu$f	45.8	6.42	54.7	9 2	72.4	14.2

NOTES: (1) Curve No. 1 of Fig. No. 6 (3) " No. 3 " " "
(2) " No. 2 " " " (4) " No. 4 " " "

Table 1. Complete data for 2, 3, and 4-element beams for both 14 and 28 mc, utilizing 10" loops.

tions (7) and (8) apply for the special case where the two loops have the same diameter, i.e., $2a$. For the more general case, where the loops are of different diameters, the reader is referred to Circular 74 or to Terman's "Radio Engineers' Handbook," page 67.

Substituting the values of *Fig. 3* into (8),

$$\frac{r_2}{r_1} = \frac{1.375''}{\sqrt{(1.375'')^2 + 4\,(5'')^2}} = \frac{1.375}{\sqrt{1.89 + 100}}$$

$$\frac{r_2}{r_1} = \frac{1.375}{10.10} = .1362$$

Referring to the curve of *Fig. 4*, it is seen that F is .0178 for a value of r_2/r_1 equal to .1362. The mutual inductance M is calculated to be, from (7):

$$M = 2.54 \times .0178 \times 5''$$

$$M = .226 \text{ microhenries}$$

The calculated value of .226 μh is seen to be about 6% lower than the measured one of .240 μh. It is seen, however, that the self-inductance of the loops and the mutual inductance between them can be computed with sufficient accuracy for design purposes. The curve of *Fig. 5* shows how the mutual inductance varies with loop spacing for the case of the 10" loops shown in *Fig. 3*.

Calculation of Primary Impedance Zp (Section 4)

Suppose the 10" loops of *Fig. 3* (spaced 1-3/8" apart) are to be used to feed a 4-element beam antenna; the primary impedance Z_p (i.e., the impedance across the primary loop terminals PP of *Fig. 2*) can be computed by means of equations (4) and (5). In this instance, the total resistance in the secondary loop circuit is that of the 4-element beam —namely, 6 ohms. The secondary loop circuit is assumed to be tuned to resonance, so we may write,

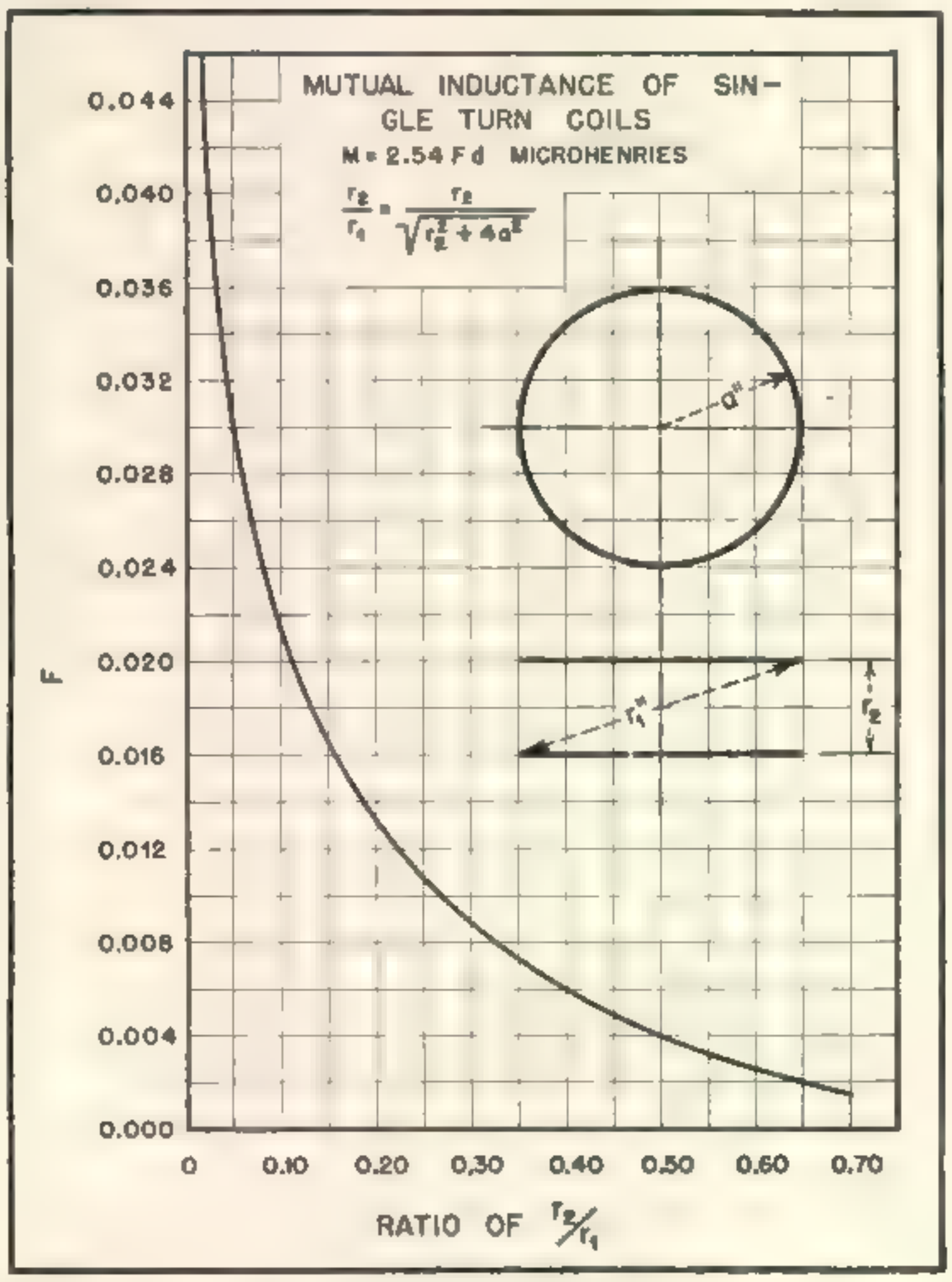


Fig. 4. Graph for derivision of F in Step 7 to determine mutual inductance of single turn coils.

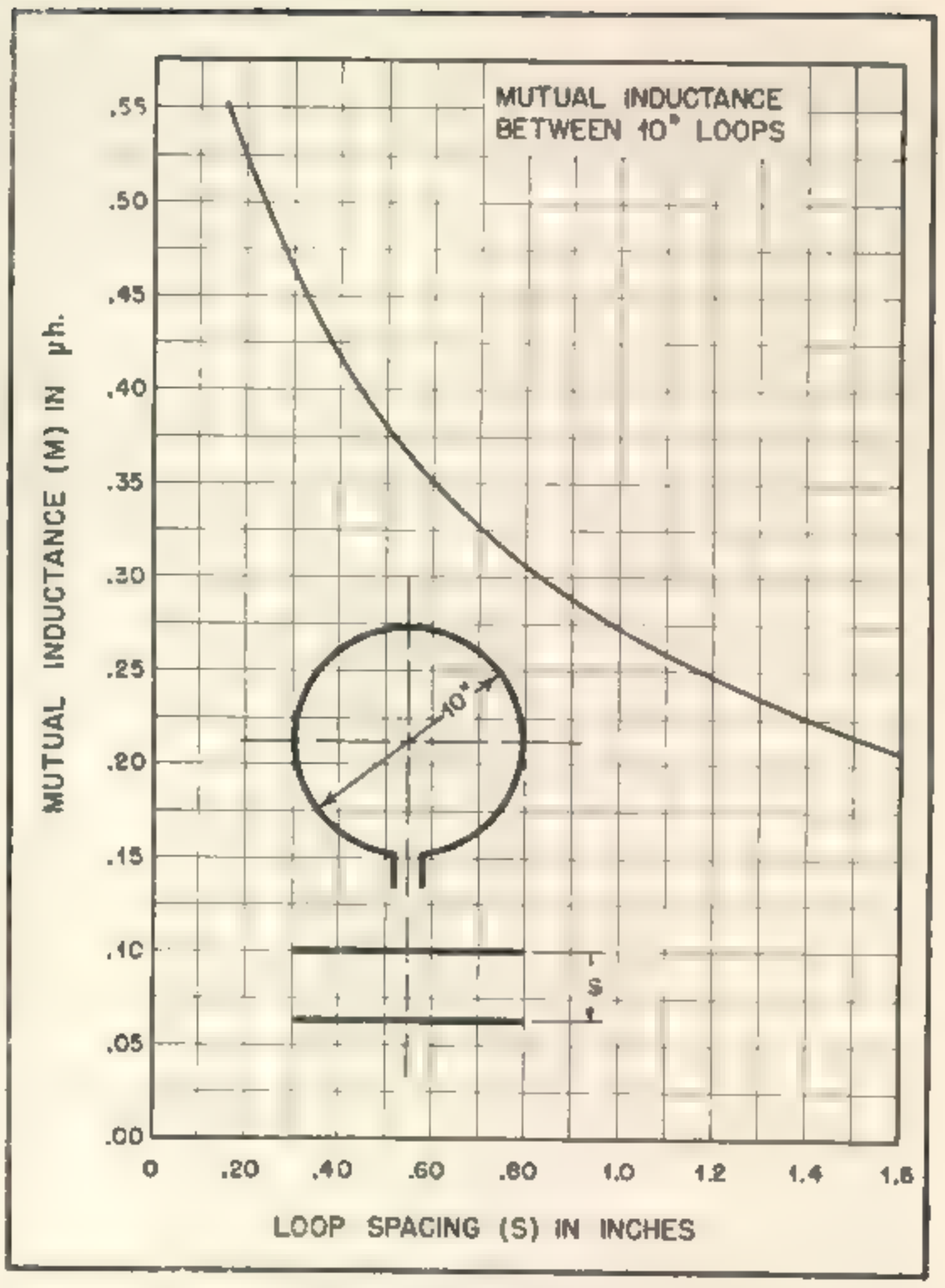


Fig. 5. Variation in mutual inductance between 10' loops with different loop spacing.

from (4):

$$R_c = \frac{(\omega M)^2}{R_s} = \frac{(2\pi f \times .240 \times 10^{-6})^2}{6}$$

Assuming a frequency of 28.85 mc, then

$$R_c = \frac{(2\pi \times 28.85 \times 10^6 \times .240 \times 10^{-6})^2}{6}$$

$$= \frac{(43.6)^2}{6}$$

$$R_c = \frac{1900}{6} = 317 \text{ ohms}$$

The primary inductive reactance is

$$X_1 = j2\pi \times 28.85 \times 10^6 \times .557 \times 10^{-6}$$

$$X_1 = +j101 \text{ ohms}$$

and the primary impedance Z_p, from (5) is

$$Z_p = 317 + j101 \text{ ohms (4-element beam).}$$

Using values of 13 ohms and 8 ohms respectively for R_s, the primary impedance Z_p for the 2-element and 3-element beam cases are computed to be

$$Z_p = 146 + j101 \text{ ohms (2-element beam).}$$

$$Z_p = 237 + j101 \text{ ohms (3-element beam).}$$

The original low impedances of these three beam antennas have been increased many times by means of the mutual inductance of the loop system. By increasing the mutual inductance, the values of R_c can be increased; it is possible to secure values of R_c (See *Table II* of *Section 8*) where the antenna can be fed directly from an open-wire transmission line. The inductive reactance term in Z_p can be tuned-out by means of a capacitance, so a perfect impedance match can be obtained. In fact, the above cases can be fed directly with some of the new types of

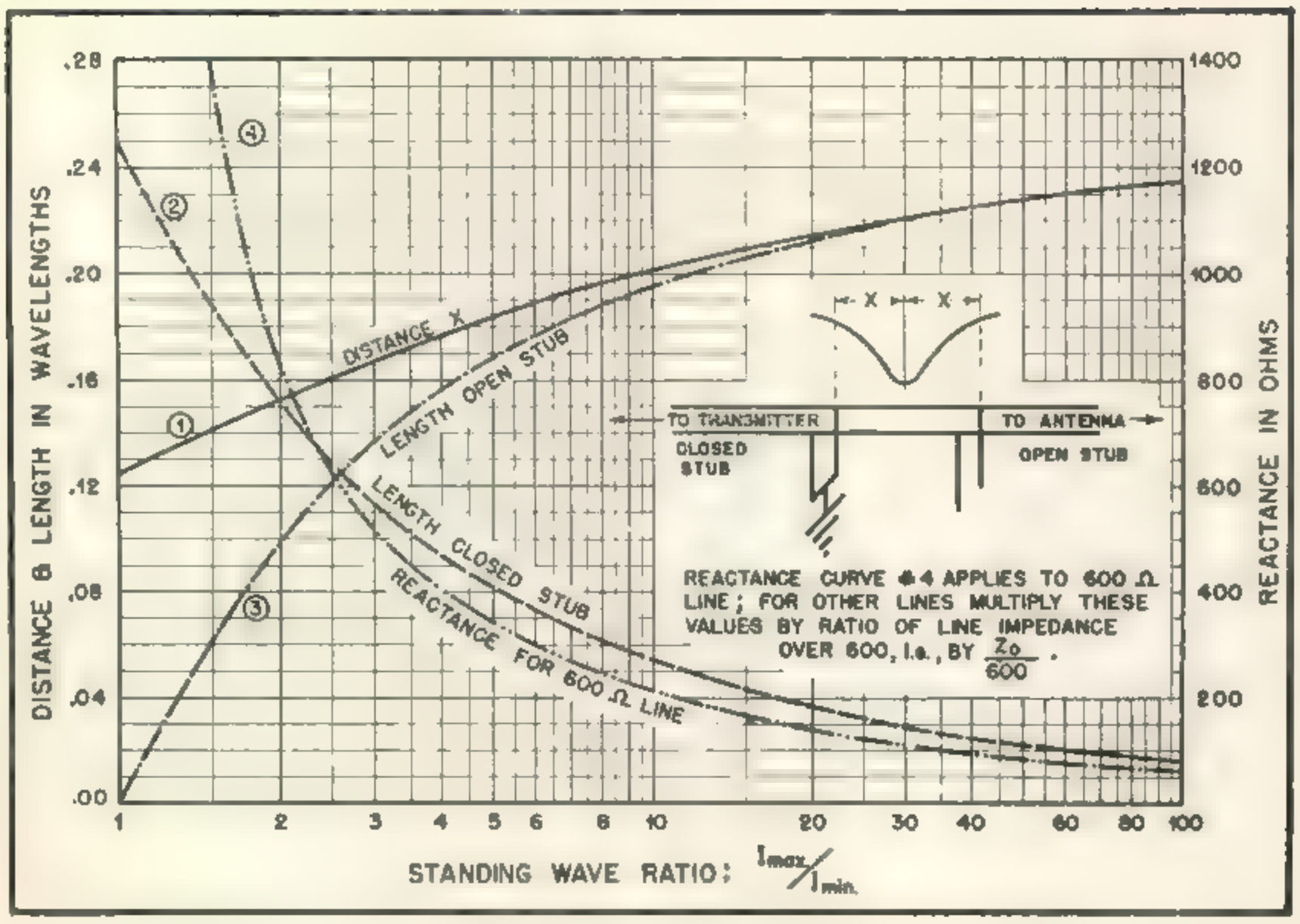


Fig. 6. Graphs to determine corrective stub or reactance to match primary loop to transmission line.

low-impedance twin line now on the market. Corrective stubs and reactances can also be very conveniently used to match these cases to a 600-ohm transmission line, as will be shown in *Section 6*. In any event, the next factor that should be determined is the standing wave ratio, SWR.

Calculation of SWR (Section 5)

The standing wave ratio SWR can be calculated, when the load impedance Z_R and the characteristic impedance Z_O are known, by means of the following expression[2]:

$$\text{SWR} = \frac{|Z_R + Z_O| + |Z_R - Z_O|}{|Z_R + Z_O| - |Z_R - Z_O|} \qquad (9)$$

The brackets, or vertical lines, indicate absolute values. To illustrate the use of equation (9), let us assume that the 4-element beam of the previous paragraph is to be fed by means of a 600-ohm open-wire transmission line; the values of Z_R (in this case Z_p) and Z_O are respectively $317 + j101$ and 600 ohms, so:

$$\text{SWR} = \frac{|317 + j101 + 600| + |317 + j101 - 600|}{|317 + j101 + 600| - |317 + j101 - 600|}$$

adding the resistance terms,

$$\text{SWR} = \frac{|917 + j101| + |-283 + j101|}{|917 + j101| - |-283 + j101|}$$

The absolute values inside the brackets can be evaluated by extracting the square root of the sum of the squares, or:

$$\text{SWR} = \frac{\sqrt{(917)^2 + (101)^2} + \sqrt{(-283)^2 + (101)^2}}{\sqrt{(917)^2 + (101)^2} - \sqrt{(-283)^2 + (101)^2}}$$

$$\text{SWR} = \frac{923 + 302}{923 - 302} = \frac{1225}{621}$$

SWR = 1.975 (4-element beam).

Following a similar procedure for the 2-element and the 3-element beam cases, the values of SWR are computed to be

SWR = 4.23 (2-element beam)

SWR = 2.61 (3-element beam)

In actual practice the value of SWR, for a particular case, would be determined experimentally by some sort of standing wave meter. The above computations were included here to illustrate the method and to show what results can be expected.

Reducing SWR to Unity By Means of Stubs or Reactances (Section 6)

The corrective stub (or reactance), affords an excellent means for matching the primary loop impedance Z_p to that of the transmission line. Continuing with the problem of the 4-element beam, let us design a corrective stub that will eliminate the standing waves and make the line flat. The value of SWR is 1.97. Referring to curve #1 of *Fig. 6*, it is

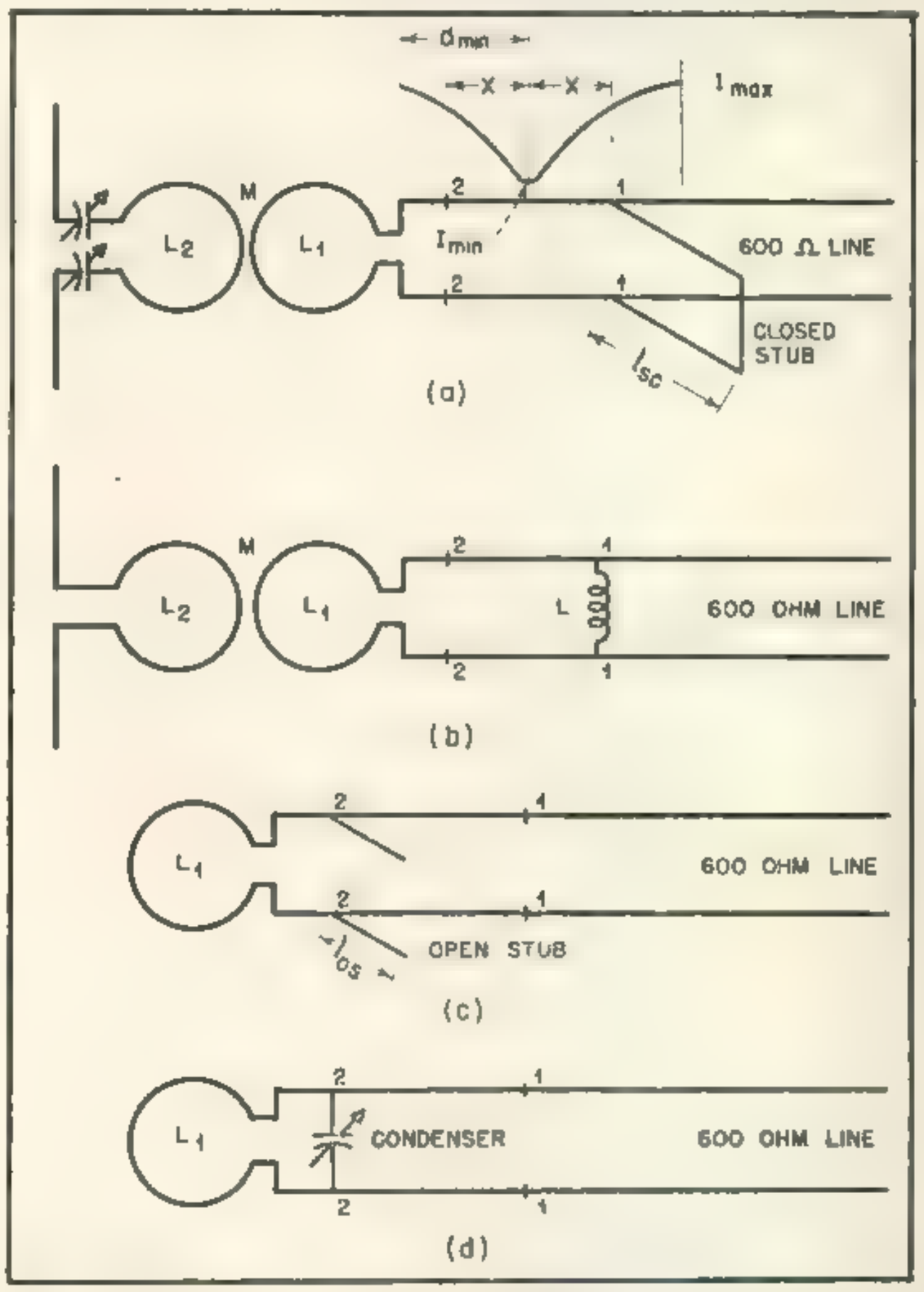


Fig. 7. Variation in methods of matching transmission line to primary loop. (a) Closed stub. (b) Inductance coil. (c) Open stub. (d) Condenser.

[2] "Transmission Lines, Antennas, and Wave Guides," King, Mimno & Wing, published by McGraw Hill Co.

TABLE II

10 Meters (28.85 mc)

Line Imped.	4-Element Array (R_a = 6Ω) M	S	Z_p	SWR[1]	SWR[2]	3-Element Array (R_a = 8Ω) M	S	Z_p	SWR[1]	SWR[2]
50 ohm	.095	See note 4.				.110	See note 4.			
70 "	.113	See note 4.				.130	See note 4.			
150 "	.165	2.20	150 + j101	1.93	1.00	.191	1.82	150 + j101	1.93	1.00
300 "	.234	1.30	300 + j101	1.39	1.00	.270	1.02	300 + j101	1.39	1.00
450 "	.285	.92	450 + j101	1.24	1.00	.331	.69	450 + j101	1.24	1.00
600 "	.331	.69	600 + j101	1.18	1.00	.380	.50[3]	597 + j101	1.18	1.00

20 Meters (14.20 mc)

Line Imped.	4-Element Array (R_a = 6Ω) M	S	Z_p	SWR[1]	SWR[2]	3-Element Array (R_a = 8Ω) M	S	Z_p	SWR[1]	SWR[2]
50 ohm	.195	1.76	50 + j50	2.61	1.00	.225	1.40	50 + j50	2.61	1.00
70 "	.231	1.32	70 + j50	2.01	1.00	.266	1.04	70 + j50	2.01	1.00
150 "	.337	.66	150 + j50	1.39	1.00	.380	.50[3]	144 + j50	1.40	1.04
300 "	.380	.50[3]	192 + j50	1.65	1.56	.380	.50[3]	144 + j50	2.15	2.09
450 "	.380	.50[3]	192 + j50	2.40	2.35	.380	.50[3]	144 + j50	3.15	3.13
600 "	.380	.50[3]	192 + j50	3.15	3.13	.380	.50[3]	144 + j50	4.20	4.17

NOTES:
(1) SWR if primary loop reactance (X_p) is not tuned-out.
(2) SWR if primary loop reactance (X_p) is tuned-out with an external capacitance
(3) Spacing should be limited to .50" spacing (see text).
(4) Spacings are getting too large and are not recommended.

seen that the corrective stub should be located a distance X of .152λ from the current minimum, I_{min}. If a closed stub is to be used, it should have a length of .153λ (curve #2 of *Fig. 6*). An open stub of length .097λ (curve #3 of *Fig. 6*) could also be used. In *Figs. 7a* and *c* are shown the cases for the closed-stub and the open-stub respectively.

Sometimes it is not convenient to hang stubs from the line, so the more compact arrangements of *Figs. 7b* and *d* may be more desirable. The required reactance to connect across the points 1–1 or 2–2 (*Fig. 7*) can be read directly from curve #4 of *Fig. 6*. The magnitude of the reactance is the same regardless of whether it is located a distance X on the antenna or on the transmitter side of I_{min}. Its sign, however, depends on its location: an inductive reactance, see *Fig. 7b*, is required on the transmitter side of I_{min}; and a capacitive reactance, see *Fig. 7d*, is required on the antenna side of I_{min}.

In this instance, the magnitude of the reactance, for SWR = 1.97, is $\pm j860$ ohms. If the inductance coil is to be used, its inductance for a frequency of 28.85 mc is computed to be

$$L = \frac{X}{2\pi f_{mc}} = \frac{860 \text{ ohms}}{2\pi \times 28.85} = 4.75 \ \mu\text{h}$$

If the condenser method is selected, its capacitance is computed to be

$$C = \frac{10^6}{2\pi f_{mc} X} = \frac{10^6}{2\pi \times 28.85 \times 860} = 6.42 \ \mu\mu\text{f}$$

Any one of the four devices shown in *Fig. 7* can be used; the choice depends on the installation and the parts available. The coil and the condenser arrangements have the advantage of compactness. Of these two, the condenser method possesses two advantages: (1) it is located nearer to the antenna by the distance 2X, so there will be less line on which standing waves exist; and (2), it is easier to vary the reactance of the condenser for final tuning purposes. The coil, however, can be adjusted somewhat by expanding or compressing it.

In *Table I* are given complete data for 2-element, 3-element, and 4-element beams, for both the 10 and the 20-meter bands, using the 10" loops of *Fig. 3*, spaced 1-3/8" apart, and a 600-ohm transmission line. *Fig. 7* illustrates the various symbols and distances referred to in *Table I* and it should be referred to when using the table. *It should be remembered that these data apply only when the secondary (or driven element) circuit is tuned to resonance!*

Reducing SWR to Unity (Section 8)

In *Sections 2* and *4* it was pointed out that the value of the coupled resistance R_c could be varied by means of the mutual inductance, M, and that by so doing an impedance match between the transmission line and Z_p could be effected. If R_c is made equal to the characteristic impedance of the line and the primary loop reactance is tuned out by means of a series capacitance, a perfect impedance results. The value of mutual inductance, M, can be computed by means of equation (4), when R_c, R_s, and the frequency are known. Suppose, for example, it is desired to feed a 4-element array (R_s = 6 ohms) directly with a 600-ohm line, at a frequency of 28.85 mc. The required value of mutual inductance M, can be computed as follows by using equation (4):

R_c = 600 ohms
R_s = 6 ohms
$\omega = 2\pi f = 2\pi \times 28.85$ mc

(*Continued on page 66*)

Monthly DX Predictions-March

OLIVER PERRY FERRELL*

THE PREDICTION CHARTS illustrate the maximum usable frequency (MUF) and the lowest usable frequency (LUF). The MUF is predicted over the path shown in the world map and is a median value wherein the MUF will be slightly higher about 50% of the time during the month. For purposes of establishing a schedule it is noteworthy that a value of 0.85 of the predicted MUF will very probably be exceeded over 90% of the time.

The LUF is determined through calculations involving the length of the path, radiated power, approximate absorption and averaged receiving conditions. In general, it provides a useful estimate of conditions on 40 meters and to some extent enables the 20-meter operator to allow for periods when signals will be weak. It will be noted that for strictly phone operation the LUF is conservative and should be about one to two megacycles higher. For weak signal c-w work it may be found that the LUF is slightly higher than necessary, but in any case is never more than one megacycle from a median value.

Graph 1 shows the median predicted conditions over a path extending from the WØ, W9 and W5 call areas to Argentina, Uruguay and a portion of Paraguay. It will also probably be fairly applicable to the portion of Chile surrounding Santiago. The very high sunspot numbers indicate that the MUF will be very high throughout this month. The 10-meter band will probably open around 0615 CST and close after 2000 hours CST. The peak conditions are expected to be from 1600 to 1900 hours CST on this band. The 20-meter band may remain open all night with scattered and weak signals coming through. From 0700 hours until 1500 hours CST this band should be closed. 40 meters will be open over this path from 1830 hours until 0445 hours CST the following day.

Graph 2 illustrates the median predicted MUF and LUF from the W9 and WØ call areas to southeastern Australia. It is expected that the month of March will provide a large number of good 10-meter band openings. As may be seen in the graph, the 10-meter band will probably open with weak and scattered signals as early as 1300 hours CST. The probable closing time is expected to be about 2030 hours CST. Peak 10-meter conditions will exist from 1700 until 2000 hours CST. Although the 20-meter band may be open a large part of the night it predicted that peak conditions on this band will correspond to the notch in the MUF occurring between 0645 and 0800 hours CST. The 40-meter band will probably open after 0030 hours and close shortly before 0800 hours CST. Conditions over this path should be stable a large part of the month.

Graph 3 depicts the conditions over a path from the Philippines to the W1, W2 and W3 call areas. It is expected that the month of March will produce very erratic conditions over this path since it crosses through a large portion of the northern auroral zones. A 10-meter band opening is predicted from 1715 hours until 1900 hours EST. 20 meters will probably be open from 0730 until 1100 hours EST. A short 40-meter band opening is forecast from 0430 until 0830 EST. It will be found, however, that very wide day-to-day variations in the MUF and LUF are likely to occur. It is estimated that 40 and 10 meters will only be open for approximately 50% of the forecast periods. It is interesting to note that the 21-mc band would be open during this month the total number of hours represented by the sum of the open hours on the three bands 40, 20 and 10 meters.

Graph 4 shows the conditions predicted from the W6 and W7 call areas to Central Europe. It is seen that 10-meter band conditions have already deteriorated and no openings are probable during the month of March. The 20-meter band may open with fair signals between 0545 hours and 0730 hours PST. A fair to good opening with improving conditions after 1600 hours PST is forecast from 1000 hours until 1730 hours PST. The 40-meter band is expected to be open from 1630 hours until shortly before midnight PST.

March is generally the period of great ionospheric disturbances. In all probability there will be one or more very severe ionosphere storms. At the present time the most probable periods of these disturbances are March 1 to 4, March 12 to 15 and March 28 to 31. Some sporadic-E activity possibly affecting 50-mc communication is expected from March 25 to 28.

The data for the MUF values depicted in the graphs is drawn from the CRPL booklets entitled "Basic Radio Propagation Predictions for March." These are available on a subscription basis from the Superintendent of Documents, Washington, 25, D. C.

*Assistant Editor, CQ.

Postscripts

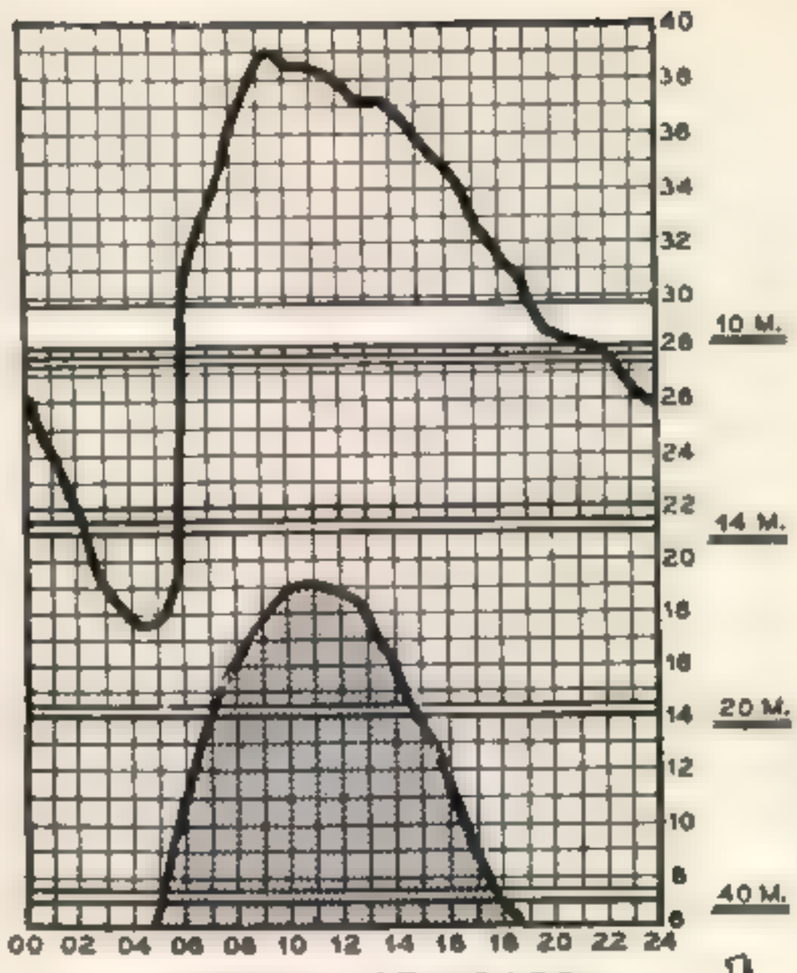
International Club Hamfest

What was probably the first international hamfest over the air took place on Nov. 30 between the Coventry Amateur Radio Society, in England, and the Frankford Radio Club of Philadelphia, Pa. In England, 30 members gathered at three transmitters in Coventry. Those who could not be present operated their own stations with messages being relayed through G5PP. On this side, Frankford members hooked up on their 6-meter intercomm and transmitted to England via W2SAI. The international club link-up was so interesting and successful that a repeat is planned.

Key Clicks

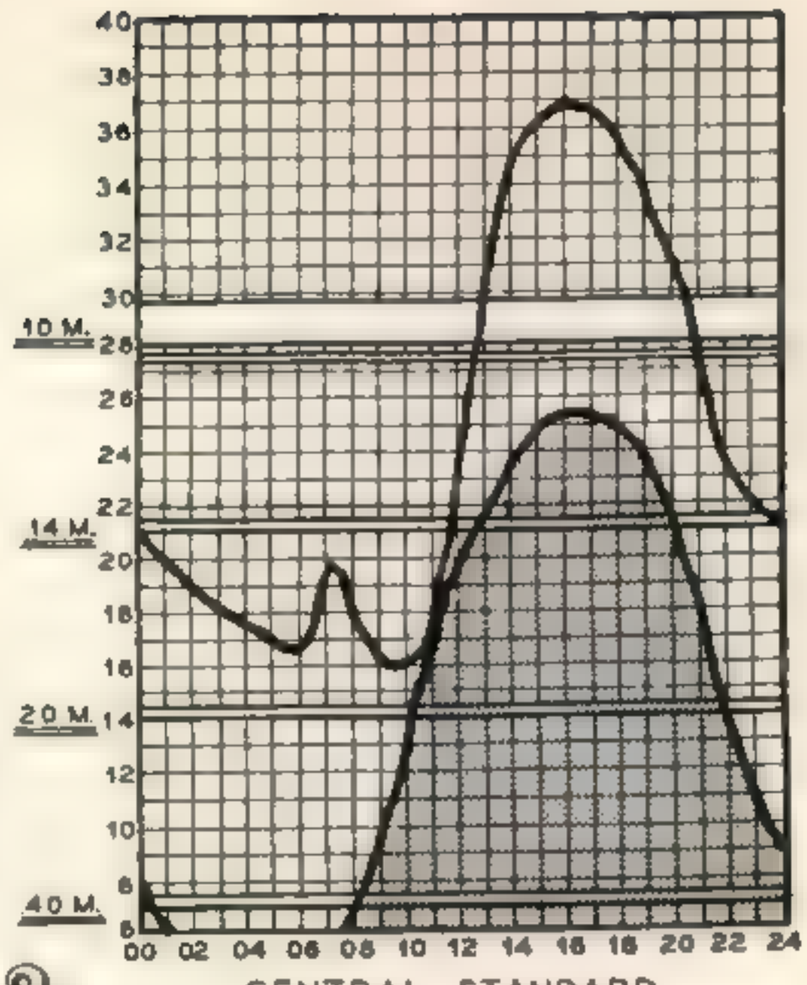
There is an error in the circuit diagram accompanying the description of W9TJC's automatic antenna relay in December Commentaries. The 2000-μf 25-v. condenser should be inserted between the bottom holding contact and the lead that connects to the phone plug and bottom of the relay coil.

Monthly DX Predictions

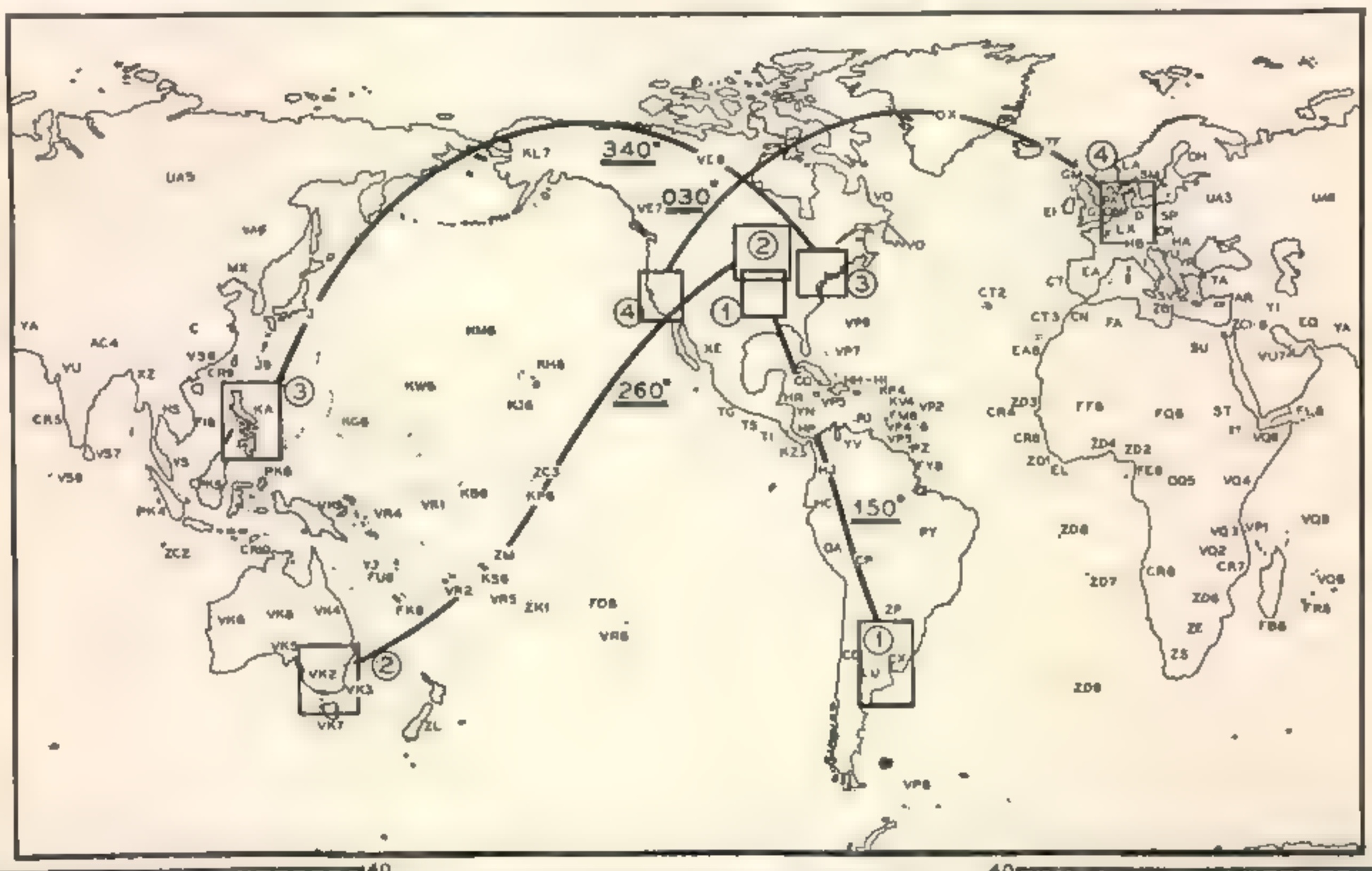


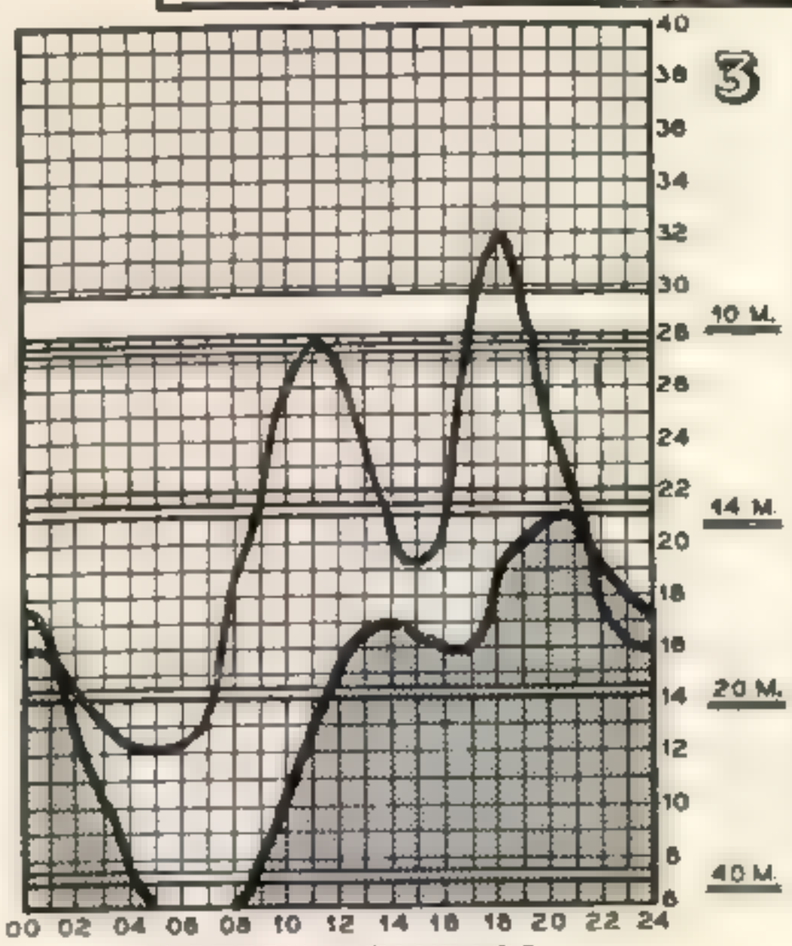
1

Maximum Usable Radio Frequencies—Charts show the maximum usable frequencies propagated by the F2-layer over the paths indicated in the world map. The abscissa shows the local standard time at the point of origin of the path. The ordinate shows the frequency in megacycles. Amateur frequencies fall within the two heavy parallel lines that indicate the upper and lower limits of the principal bands.



2



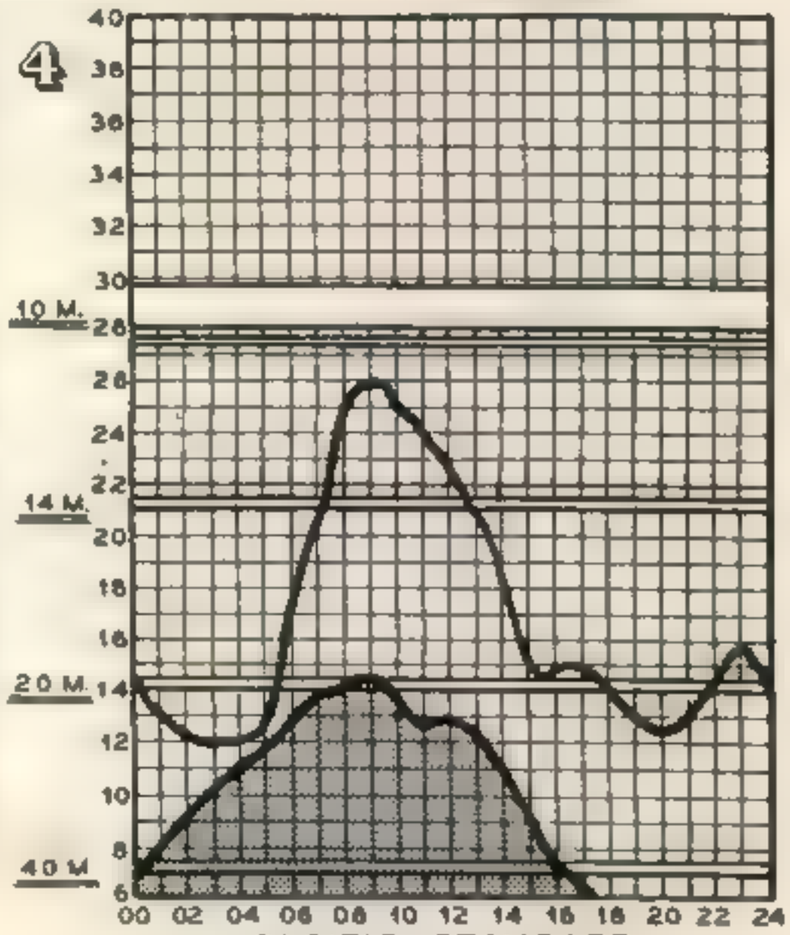


3

Lowest Usable Radio Frequencies—The shaded area in each chart indicates unusable radio frequencies for the illustrated path. The LUF is calculated for an above average amateur location using a good communications receiver. The effective radiated power is assumed to be 1000 watts. The LUF is based upon average monthly signal absorption and does not include the effects of abnormal or auroral zone absorption.

Azimuth—Radio transmission is known to vary considerably with geographic latitude and longitude. Each path MUF and LUF as illustrated is calculated for the "short-path". This is the path shown in the map.

Variations in Forecast—All graphs are monthly predicted average conditions. On ionospherically "quiet" days some variation amounting to less than 15% may be expected. However, a value representing 0.85 of the MUF will be exceeded over 90% of the total time. The graphs do not indicate radio propagation conditions during ionosphere storms or sudden ionosphere disturbances. They are not adjusted for the effects of sporadic-E layer formation or long and short scatter. Radio disturbances of the ionosphere storm type are the most severe for paths which pass through the auroral or polar regions, the effects gradually tapering off towards the equator.



4

Conducted by HERB BECKER, W6QD*

THE 1948 DX MARATHON is underway. A little more than two weeks have gone by of 1948, which is hardly enough time to receive any returns. In spite of this short time, there have been a number who have sent in their lists, and this is as good a time as any to show the first scores. Obviously, there is a preponderance of local stations showing up in the first tabulation, but, by the April issue, I hope to have returns from around the world.

1948 DX Marathon

C.W. — Phone

	Zones	Countries
W6ITA	31	45
W6PFD	30	40
W6SN	24	36
W6AM	22	24
W8NK	19	28
W6WKU	18	23
W6LRU	15	16

Phone Only

W6DI	28	59
XE1AC	22	34

You can see that W6ITA and W6PFD started out with a bang, ITA having 31 and 45, while PFD is close behind with 30 and 40. Evidently, these fellows made a quick recovery from New Year's eve. In the phone to phone section, at this point, we only have two entries, one of which is one of our more argumentative committee members, W6DI, with 28Z and 59C. Guy was a little bashful about being the only W phone station, but I told him that we should have somebody on the DX committee working something, and he seems to be the only one, thus far. I am glad to see XE1AC in there with his 20 zones and 34 countries, as this shows real interest on his part.

**Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.*

Two of the outstanding English DX men. George Elliott, G5LI (l.) and Jim Kirk, G6ZO.

There is one very important point which I want to stress again regarding entering the DX Marathon. I believe a few of the boys may have overlooked this point. Here it is: In order to receive credit, claims sent to us for Zones, and/or Countries, must be post marked within sixty days from the date of the QSO. This will assure listing the current monthly scores in CQ and eliminate last minute entries.

This is of the utmost importance and should be told to all your friends who are in the Marathon. Any claims beyond the sixty day period will be ruled out by the committee. Obviously, the best way for all would be to send us your claims each month. The 15th of every month is the closing date, and if you would mark a date on your calendar, sufficiently in advance of this date, it would be a good reminder to send in your monthly Marathon scores.

W. A. Z. For W7FZA, W6TI, W6LER and W6WKU

To W7FZA, Dick Schoepflin, of Portland, Oregon, goes W.A.Z. certificate No. 13 (unless he decides No. 13 on his certificate would be a jinx). W7FZA shows up in the Honor Roll with 40Z and 155C. Certificate No. 14 goes to W6TI, Horace Greer, Oakland, California. Since Horace is the W6 QSL manager, we have razzed him for quite a while, because with five or ten thousand cards to choose from, he really should have had W.A.Z. long ago. Seriously, the hold-out for Horace was *C8YR*, who is beginning to send his new cards through. W6TI shows at 40Z and 126C. W6LER, Gordon Orelli of Long Beach, California, is awarded certificate No. 15, and the Honor Roll has him chalked up for 40Z and 140C. C8YR, likewise, turned the trick for Gordon. W6WKU, Dewitt Jones, is awarded W.A.Z. certificate No. 16. The two hold-out zones for Dewitt were 17 and 23. He moves up the Honor Roll to 40Z and 146C. Our congratulations to all of you for this achievement.

Hooray! New Countries

The following countries have now been added to the Official Country List, and your claims for these countries will be honored by the DX committee.

Lebanon	AR8
Syria	AR1
San Marino	(M1)
Pakistan	(VU)

In the case of Lebanon and Syria, the prefixes are obvious, and, as far as we know, the only station in San Marino is signing *M1A*. San Marino was never included in any of the prewar or postwar Country Lists for the reason that the possibility of anyone getting on the air from there seemed very remote, and we all agreed we would let these very small and remote countries ride until some reason popped up to include them. From the records, San Marino is the oldest state in Europe; covering an area of about 38 miles; has an independent government, and

(*Continued on page 74*)

W. A. Z. HONOR ROLL

C. W.-PHONE

W6VFR	**40**	**184**
W8HGW	**40**	**183**
W6PFD	**40**	**179**
W2BXA	**40**	**178**
W6ITA	**40**	**176**
W6MJB	**40**	**174**
W6SA	**40**	**170**
W6ADP	**40**	**165**
VE7ZM	**40**	**155**
W7FZA	**40**	**155**
W6LEE	**40**	**150**
W6WKU	**40**	**146**
ZS2X	**40**	**142**
W6LER	**40**	**140**
W6SAI	**40**	**135**
W6TI	**40**	**126**
G2PL	39	185
W2GWE	39	182
W8RDZ	39	182
G6ZO	39	180
W3BES	39	178
W6ENV	39	172
W8BKP	39	170
W2HHF	39	169
W3JNN	39	166
W5ASG	39	164
W4CYU	39	164
W9ANT	39	160
G5DQ	39	160
WØYXO	39	160
W2PEO	39	160
W6DI	39	158
W6PCS	39	158
G8KP	39	156
G6QB	39	152
W6SN	39	152
W6EBG	39	152
G5YV	39	151
G2AJ	39	151
W8NBK	39	151
W6KRI	39	151
W2COK	39	150
WØNUC	39	150
G2WW	39	147
W6FHE	39	147
W7BD	39	147
D2KW	39	147
W8LEC	39	146
W6TT	39	145
WØGKS	39	144
W9IU	39	143
W6ZCY	39	143
G3DO	39	142
WØNTA	39	142
W9DUY	39	141
G6BQ	39	140
G3FJ	39	139
W6OMC	39	138
W3JTC	39	138
W6BAM	39	137
ON4JW	39	136
W6RDR	39	134
W6AM	39	134
W6BPD	39	134
G5RV	39	132
G2VD	39	132
G2CDI	39	132

C.W.-PHONE

CE3AG	39	132
W6GDJ	39	131
VE7HC	39	131
G2FSR	39	130
W9NRB	39	126
G5BJ	39	126
G3AAM	39	126
G5VU	39	124
W6EAK	39	123
G3AAK	39	122
W6ANN	39	121
G5WM	39	120
G8RL	39	120
W7BE	39	120
G6BS	39	117
G3QD	39	116
W6YZU	39	114
G3TK	39	114
MD1D	39	110
W6QD	39	109
W6UZX	39	109
W7GXA	39	106
OK1AW	39	106
W7ETK	39	105
KG6AL	39	102
W6EPZ	39	101
W6AX	39	93
G6PJ	39	76
W2CYS	38	144
W3GHD	38	142
W9RBI	38	142
W2HZY	38	140
W3EPV	38	140
W8FJN	38	139
W2IOP	38	137
W3EVW	38	137
W4BRB	38	133
W1NMP	38	133
W8CVU	38	133
G8IL	38	131
W4INL	38	131
G5CI	38	130
W3IYE	38	130
W3ZN	38	128
G6LX	38	126
W2RDK	38	124
GW3AX	38	123
WØSQO	38	123
W9YNB	38	117
W5CPI	38	113
W9VNB	38	113
G3Z1	38	107
G8IP	38	105
W6LEV	38	79
G3BI	38	75
W1BIH	37	132
PY1DH	37	128
W4OM	37	126
KP4KD	37	124
W1KFV	37	121
W2TJF	37	119
G4CP	37	117
W3KDP	37	115
W1JYH	37	114
W4ML	37	112
WØOUH	37	112
W9MZP	37	111
W4FPK	37	110

C.W.-PHONE

W2PQJ	37	110
G4AR	37	108
VE1EA	37	107
G5MR	37	100
W2BLS	37	100
VK2ACX	37	99
G3AAE	37	99
W8WWU	37	99
W2SGK	37	95
W8VLK	37	92
W6LN	37	82
W2CWE	36	125
W2RGV	36	119
SV1RX	36	119
W3ZN	36	119
MD5AK	36	118
W9LNM	36	116
W6RW	36	116
G2CNN	36	114
G2AKQ	36	112
W2PUD	36	111
W9TB	36	101
W5BK	36	101
W2CNT	36	100
WØAZT	36	100
G2AO	36	100
G6WX	36	95
GW4CX	36	92
W6PQT	36	90
W9FKH	36	88
W8HSW	36	85
W4MZ	36	85
GM2AAT	36	75
W2DYR	35	110
W8REU	35	104
G8VR	35	100
VE3AAZ	35	99
W6YYW	35	92
G2AVP	35	89
W6DLY	35	89
W9FNR	35	85
D4ANM	35	80
G8RC	35	78
G3BDQ	35	74
CM2SW	34	132
W8AVB	34	105
G8QX	34	99
G8KU	34	96
W9WCE	34	96
VK4RC	34	91
W7BTH	34	91
W3JKO	34	91
G6XX	34	89
W6LRU	34	87
W4DIA	34	86
W2JA	34	84
W6MI	34	84
W7BTH	34	83
D4AVE	34	81
D4ANM	34	77
J4AAK	34	66
W6BIL	34	63
W7FNK	34	54
W2ZW	33	115
W4QN	33	94
W6ZZ	33	91
W4HA	33	91
W3AYS	33	88

C.W.-PHONE

G2LC	33	85
W2GUR	33	82
W5BK	33	79
GM2UU	33	79
G8VG	33	78
G3BFC	33	77
W9EMW	33	74
W7EYS	33	68
W2WC	33	65
W6WUD	33	61
W4HA	32	88
W2HY	32	77
G3AGN	32	74
G3VA	31	101
W2GVZ	31	82
G5OQ	31	78
W6IFW	31	77
G6BB	31	74
W8JM	31	71
W5LVD	31	71
KP6AB	31	70
W4HXO	31	67
W6KMN	31	66

PHONE

W6DI	38	135
W4CYU	37	143
W1HKK	37	131
G6LX	37	124
G2AJ	37	121
G3DO	37	114
W8BKP	37	113
G3DO	37	110
G2PL	36	128
W1JCX	36	126
G6BW	36	119
W2BXA	36	119
G5YV	36	106
G6WX	36	105
W7HTB	36	104
W3DHM	36	96
W6SA	36	80
W2DYR	35	122
W8BF	35	120
W1MCW	35	116
G3FU	35	115
W1NWO	35	112
W6PXH	35	108
GM2UU	35	107
G8QX	35	100
W9HB	35	89
W3JNN	34	113
W9RBI	34	99
W8BIQ	34	97
W6PCK	34	91
W5ASG	33	98
W2ZW	33	113
W2PQJ	33	90
W8QBF	33	79
W2DRH	33	60
XE1AC	32	103
W4INL	32	88
W4HA	32	83
W2HY	32	81
WØHX	32	80
W9GZK	32	72
G6BW	32	69
W2NXZ	32	57
W5LWV	31	79

Conducted by VINCE DAWSON, JR., WØZJB*

While Transcontinental and Atlantic F2 openings in December and January have been very quiet 50 mc. has come forth with Es openings. The last Atlantic opening was on Dec. 18 between G5BY and W8MVG, while the trans-con's between W1-2-3 and W7s petered out Jan. 2.

In contrast to the above openings, Es showed its presence when very good openings occurred Dec. 27 and Jan. 4. The Dec. 27 opening was most unusual. After having the band open from 1000 EST, W4EID and W7QLZ made contact at 2100 EST, for the first double-hop Es reported in the middle of the winter. W7QLZ in Phoenix heard W4FLH in Miami, Fla., for 2 hours, working W5s. This opening also marked the appearance of several new stations in W4, including; W4JEA, Wake Forest, N. C., W4LNG, Atlanta, Ga. W4EID in Jacksonville, Fla., highlighted Dec. 27 by working 50 stations between 1030–2215 EST in W1-2-3-4-5-7-8-9-Ø VE3, just lacking W6 for a WACA . . . all this in mid-winter!!

The Es opening on Sunday morning, Jan. 4 found practically all Eastern districts from Mass. to Va. and as close in as Ohio, working the middle-west W9s and WØs. These openings allowed some of the gang to pick up a few more states to boost their totals.

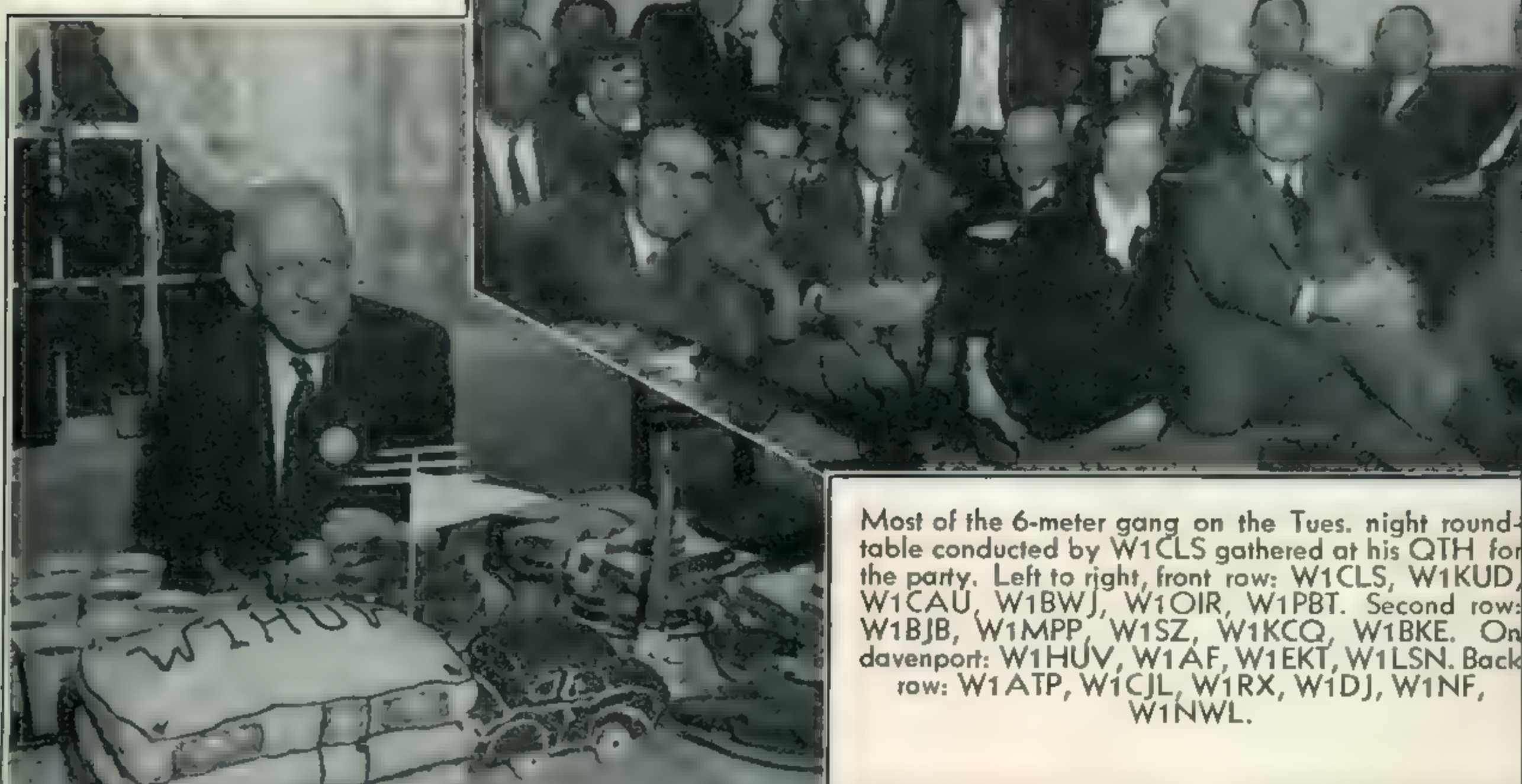
The dawn of 1948, Jan. 1, brought a good trans-con opening between W1-2-3 and W7 from 1504–1555 EST, which started very late as compared with other openings. Despite this opening some of the gang were far from joyful. A sleet and wind storm, reaching hurricane proportions took down many 50-mc. arrays. W9ZHB, in Zearing, Ill., lost both his 70′ 50-mc. array and the new flop-over 2-meter beam, the latter falling through the shack. W9ALU, W9AB and W5FRD were also among those who lost their arrays.

Heres a bit of good news. ZS1P advises that his 50-mc. permit has been extended indefinitely and other ZSs expect them soon. The Gs 50-mc. permits have been extended to April 30, and are now open to any one paying the 10 shillings ($2.00) tax, with a power of 25 watts maximum input. HB9BZ, Karl Beilstein, gives us information on their operation on 50 mc, saying that although the hams are not authorized 50-54 mc., official Swiss factory stations have the spectrum from 49.6 mc to 54 mc. These "factory" stations eivdently are tube manufacturers who test their tubes in transmitters around this band. A nice break for 50 mc. DXers, as their receivers were variable over the same range, which covered 6 meters.

HB9BZ goes on to say he was the operator of HB8VD, and HB8VK by another ardent v-h-f operator, HB9CD. Karl says that HB9BK was not operating on 6 meters, no doubt a receiving error. During the peaks of the openings signals often faded out completely, and at other times sounded very much like the 28-mc. band, with signals strong and steady. While 6-meter signals were coming in, the FM-BC stations in the U.S.A. were pounding in also.

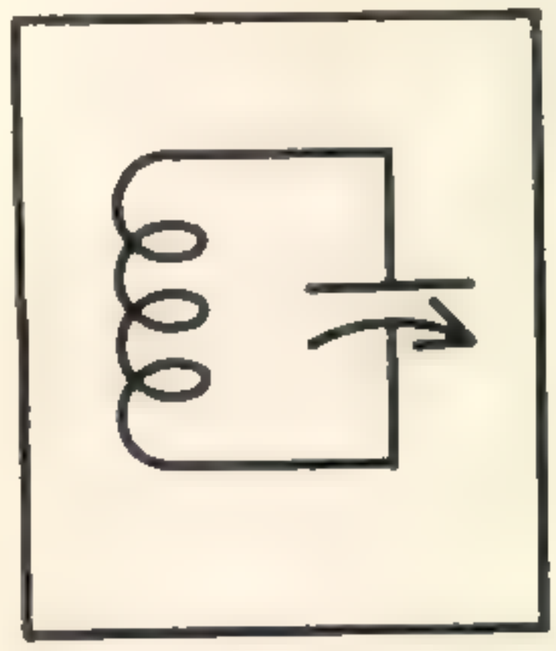
Send all contributions to Vince Dawson, Box 837, Gashland, Mo.

W1HUV, at the party in his honor on Nov. 2nd before he left for Tucson, Ariz.



Most of the 6-meter gang on the Tues. night round-table conducted by W1CLS gathered at his QTH for the party. Left to right, front row: W1CLS, W1KUD, W1CAU, W1BWJ, W1OIR, W1PBT. Second row: W1BJB, W1MPP, W1SZ, W1KCQ, W1BKE. On davenport: W1HUV, W1AF, W1EKT, W1LSN. Back row: W1ATP, W1CJL, W1RX, W1DJ, W1NF, W1NWL.

(Number six of a series)



Commercially wound fifty watt exciter coils are universally popular items these days, finding a place in most amateur transmitters. Old Timers like them, remembering readily their early days in ham radio when all coils were laboriously wound by hand, more by necessity than by desire. Wound virtually on air and strengthened by a small amount of excellent insulating material, commercial exciter coils are made in a sufficient number of varieties to enable their use in practically all types of low power transmitter circuits. These coils are generally supplied with one of three types of separate link coupling coils, depending upon the use to which they will be put, wound for any of the amateur bands from 6 to 80 meters.

When describing the coil for any particular band, the manufacturer specifies a capacity value which will resonate it at the low frequency end. The National AR16-40E end link exciter-coil, for example, will resonate at the low end of the 40-meter band with 33 $\mu\mu$f. capacity, a value which includes all stray circuit and tube capacities across the coil. If we are using a single ended 807 amplifier stage, about seven $\mu\mu$f of the 33 $\mu\mu$f total will be found in the tube's output capacity. With careful layout and high quality insulation throughout, one can allow about 10 $\mu\mu$f more for stray capacities between the wiring and ground. Therefore, the variable condenser to be used would have to add the remaining 16 $\mu\mu$f to the circuit to obtain resonance at 7 mc., assuming the output circuit has no effect on the tank.

When selecting exciter coils, it should be determined which of the available types of link coupling coils best meets circuit requirements. An *end link* model should be employed in single-ended oscillator and amplifier link coupling circuits, especially at frequencies above 28 mc. when it is not desirable to use capacitive interstage coupling. The latter type of coupling has the deleterious effect of placing part of the input capacity of the following stage across the tank circuit of the previous stage, incidentally. An end link, in common with all others, should always be physically located at the low r-f potential end of a coil, or at the end nearest ground. Push-pull and other balanced stages require the *center link* model. With this type, symmetry is maintained and the link is placed closest to r-f ground by virtue of its center position in the coil. The two links just mentioned are both fixed in production at optimum coupling points which are adequate for most interstage transmitter applications. However, low powered final amplifier tank circuits generally require a variable, or physically movable, link so that the antenna coupling may be properly adjusted for best loading. The *swinging link* is a center link type of winding so constructed that the coupling can be varied. It should be used in a balanced tank circuit, and is especially convenient when feeding a balanced antenna with Twin Lead transmission line. A low impedance transmission line can usually be directly connected to the link and, if the line is properly terminated, r-f output can be fed over distances of several hundred feet without excessive losses.

Seth Card WIDRO

National NC 1914

ADVERTISEMENT

50-MC DX HONOR ROLL

Calls	States	Districts	Others
W6UXN	46	10	VE1, 2, 3, 6, 7-KH6
W4GJO	45	10	VE1, 2, 3-OA4
WØZJB	45	10	VE2, 3, 4, 7-G5
WØUSI	45	10	VE2, 3, 7
W6WNN	45	10	VE1, 7
W9DWU	45	10	
W9ZHL	45	10	VE1, 2, 3, 4, 7-XE1-KL-G5-HB8-G6, 5-KL7
W1CLS	44	10	VE1, 3, 7-G5, 6-F8-PAØ
W7BQX	44	10	VE1,3,4,7
W7ERA	44	10	VE1, 7
W7FFE	44	10	VE1, 7
WØDZM	43	10	VE1,2,3,7
WØQIN	43	10	VE1,2,3,7
W9PK	43	10	VE1, 2, 3, 4-XE1
W9ZHB	42	10	VE3, 4, 7-G5-HB8-KL7
WØBJV	42	10	VE2, 3, 7
W3CIR/1	41	10	VE1
WØINI	41	10	VE2, 3, 4
W5VY	40	10	VE3, 4, 7-KH6-LU9-XE1-OA4-PAØ-G2, 5, 6,-F8-HB8, 9
W8ZVY	40	10	VE1, 2, 3-OA4 - LU9 -KL7- PAØ, G2, 5, 6
W4QN	40	10	VE2, 3 - OA4
W1LLL	40	10	VE1-G5 - G6 - PAØ
W8NSS	40	10	VE1,4-VP7
WØSV	40	10	VE7
W4GIY	40	10	VE1
W4EQM	39		VE1, 2, 3, 7-XE1-KL7
WØYSJ	39	10	VE2, 3, 7
W6AVV	39	10	VE1,7-KH6
W7HEA	39	10	VE1-7
W8QYD	39	10	VE1, 4 - OA4-G5
W5JLY	38	10	VE3, 7-XE7 -OA4 -G5, 6 - PAØ HB8
W4EID	38		VE1, 2, 3, 7-OA4
W2AMJ	38	10	VE1, 3, 7-G2, 4, 5, 6-F8 - PAØ - HB8
W5AJG	38	10	VE2,3-KL7-G5, 6-HB8 -PAØ
W5FRD	38	10	VE3, 7-XE1 -PAØ
W5ML	38	10	VE3-XE1
W8ZVY	38	10	KL7-G5
W6OVK	37	10	VE1, 2, 3, 7-KH6
W9RLV	37	10	VE1, 3, 7-KL7-G2, 5, 6-PAØ
W2IDZ	37	10	VE1, 7-G5-G6-PAØ - F8
W6OYK	37	10	VE1,2,3,7-KH6
W7DYD	37	10	VE1, 7
W9UNS	37	9	
W5VV	36	10	VE7-XE1
W7FDJ	36	10	VE1, 7
W5FSC	35	9	VE1, 3, 7-XE1 - OA - KL7
W1GJZ	35	10	G5, 6-HB8 -PAØ
W5HF	35	10	VE1,3,4,7
W1JLK	35	10	VE7-G5
W2BYM	34	10	VE1-VP7
WØDKS	34	10	VE3
WØJHS	34	10	VE1-2
W7GPA	34	10	
W4WMI/4	33	10	VE1, 2, 3-VP7
W1HDQ	33	10	VE1 - G5 - G6-PAØ
W6BPT	33	10	VE1, 2, 3, 7-KH6
W4DRZ	33	10	VE1, 2, 3,
W6PUZ	33	10	VE3-7
W7KAD	33	10	VE7
W3MKL	33	10	VE1, 7-G5
W1CLH	32	10	VE7 - G5 - G6
W3RUE	32	10	VE1-G2, 5, 6
W6FPV	31	10	VE1, 2, 3-KH6
W4FBH	31	10	VE1, 2, 3-XE1
W5LCZ	31	10	VE3-XE1
W3OMY	31	10	VE1-VP7
W9ALU	31	10	VE1, 2, 3, 4-G5-KL7
W5WX	31	10	VE4-XE1
W4HVV	30	10	VE1, 2, 3
W9UIA	30	10	VE1, 2, 3
W5ELL	29		VE7-XE1
VE1QY	28		G5, 6-VE1, 3, 7
W4EQR	28	10	
W6ANN	28	9	VE3-7
W1CGY	28	8	VE1 -G 5-G6-PAØ
W4FQL	28	9	VE1
W1ATP	28		VE1, 7-G5
W9FKI	28		VE1, 2, 3 - KL7
W7ACD	27	8	
W5LBG	26	8	VE7-XE1
WØDNW	26	10	
WØYKX	26	10	VE2, 3
W7BOC	26	9	VE1
W6NAW	25	9	VE7
W5ESZ	25	8	VE7
W4FNR	25	8	VE3-OA4
VE1QZ	24	8	VE1, 2, 3, 7-G2, 3, 5, 6-F8 - HB8-PAØ
W7JPA	24	8	VE7
W5LIU	24	8	VE3-XE7
G5BY	23	8	W1, 2, 3, 4, 5, 8, 9, Ø-VE1, 2, 3-MD5 - SU1-ZS1
W8MVG	23	9	G5, 6-PAØ -F8
W9AB	23	9	VE1,2,3,4
W7CTY	22	9	VE7
W4JML	20	9	VE2-3-G5
W7ACS/KH6	3	3	W5, 6, 7-J9 - VK5 - KH6

Input was about 200 watts on c.w. at HB8VK and 30 watts at HB8VD, both rigs self-controlled oscillators with FD and PA. The receivers at each station were variable frequency superhets. HB8VK used a 3-element beam on top of the factory, while HB8VD used a dual 5-meter centerfed antenna, at an angle of 40 degrees above the horizon.

Actually these paths on 6 meters coming from Europe were very sharp, and at times seemed to be varying from the normal straight "as the crow flies" path. This was in evidence on Nov. 23-24-26-27, for on these dates the WØs in Iowa 250 miles north of Gashland, and the W5s in Texas 450 miles south of us were able to work the PAØs, F8s, HBs and other districts in England, while at WØZJB we were only able to work G5BY. Further, with most of the reports in from Europe, we find our signals just didn't make it to anyone, other than G5BY. Only once when we were able to contact G5BY did we hear him working and calling the East Coast. Hilton, G5BY, mentions that the band would open to W8, then in would pop a W9, then a WØ and as they passed out, the W5s. Yet reports from G6DH, 200 miles further north of G5BY, indicate he was working these same districts, but at different times than G5BY, and in some instances with better signal reports, particularly from the W5s. It is too bad that we can't present to you in full the logs of G5BY-G6DH. It is amazing how they were able to keep such accurate records. G5BY's log of stations heard, over 45 mc., shows some 600 entries,

(Continued on page 82)

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73, *Bil Harrison,* **W2AVA**

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Model C75. 75 watt CW.	**$145.00**
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Model C500. 500 watt CW.	**345.00**
Model FV500. 500 watt VFO NFM Phone	**435.00**

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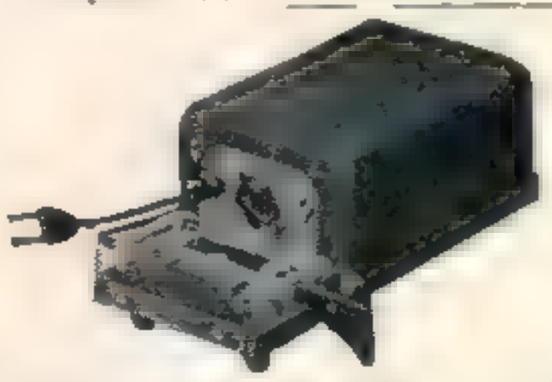
Willard RECHARGEABLE battery to clip into pack. 3 cells, 6 volt, 30 watt hour. NON-SPILL unbreakable plastic case. Complete..... **$1.55**

Primary Battery
Willard. To be used in pack when recharging facilities are unavailable. Indefinite shelf life. Each.. **90c**
20 for $9.95



"MONKEY"

Ditch that Lake Erie swing! Be one of the few to have a tape-perfect fist by using this first ELECTRONIC KEY priced for the Amateur. Makes **uniform** dots, dashes, **and spaces**—automatically! One control sets speed 8 to 45 WPM, maintaining correct ratios. Side-swipe lever. Built-in speaker permits monitoring of transmission and code practice. Internal keying relay.

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Covers .54 to 54.5 MC — eight tubes — two 2 MC IF stages throw images outside band — series type noise limiter — and many other new improvements. An exceptional value at..... **$79.50**

National NC-33
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120 VA	30806	32.00	2 KVA	30811	225.00
250 VA	30807	52.00	3 KVA	30M813	300.00

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The YL's Frequency

Conducted by LOUISA DRESSER, W1OOH/2*

CUPID FINDS all manner of ways of accomplishing his purpose, and we know that ham radio has often lent a helping hand, but now, for the first time (since the war, at least), we have learned of an actual proposal of marriage (and acceptance!) effected via the short waves.

It seems that Damien Vermander and his brother Claude, VE3BOC, of Winnipeg, are both with the Royal Canadian Corps of Signals in Ottawa. Well, on Sunday, Jan. 11th, the boys sent a message via Len Cuff, VE4LC, to Danny Wood, VE4LF, a friend of the family, asking him to bring their parents and Damien's girl friend, Jeanne Drouin, to VE4LF's shack for a QSO. Contact was established in the early afternoon and after a round of greetings Jeanne took up the mike for a chat with Damien. He, to the surprise of all concerned (including himself, no doubt, for he maintains it was quite unpremeditated), popped the question. It took Jeanne a few breathless seconds before she could modulate the carrier sufficiently to reply, "Oh! Je suis si heureuse!" ("Oh! I am so happy!")

The San Diego YLRL

Our salutations to the San Diego Young Ladies' Radio League, an up-and-coming club which may well be proud of its record. Started only last May with three licensed YLs, since then six more members have received their tickets and seven other members are actively studying up on theory and code. The club meets the third Wednesday of each month in the Linda Vista Community Center, and follows the business meeting with a social hour. There are no club dues, funds being obtained through prize drawings. (Five or six radio prizes are raffled off at each meeting, with tickets selling for 10c each.) The club also has its own newsletter which it publishes monthly.

Knowing you will be interested in more than a picture of the gals, we'll attempt to give you a vignette of each, as well.

Marion Alford is the XYL of W6ZXK, who has a chief's rating in the Navy. They are the proud possessors of a jr. op born in January. An active member of the club, the others will hate to see her leave when the OM's imminent transfer to W7 land (Washington) comes through.

Eleanor Baldwin, W6AWW, is publicity chairman for the club. One of the lucky YLs to get reissued "A" calls, she is the XYL of W6VUK. Her first night on the air she worked Pacific DX.

Jean Baptie, W6ZYD, is the club's vice president. Besides caring for her three youngsters, she attends classes in arts and crafts, is a church organist, and does loads of sewing. Her OM is W6AMQ.

Mable Field, W6YZV, lives some distance from San Diego in Fallbrook, and doesn't get to all of the meetings. With an addition to the family last December, she and her OM, W6LKC, now have two jr. ops. Mable is active on most bands, likes to work DX, and at present is acting as northern outlet for the San Diego County Emergency Corps.

Neva Fredenburg, W6YXI, really should have the call "OBG"—"one busy gal." Besides keeping house she has a full-time job, is the secretary of the Palomar Radio Club, and prints the club's YL Newsletter. Her OM is W6VJQ.

Suze Grey, the XYL of W6WNN, is a fairly new member of the club and travels in from La Mesa to attend meetings. We hear she is lucky at the prize drawings. . . .

Margaret Kittel is the XYL of W6ZCQ. She has little time to get to the meetings for she teaches school during the day and at night as well—which makes for a very full schedule!

Peggy Mulligan, W6AQL, is secretary of the SD YLRL. She finds the three men in her family—two jr. ops and OM, W6WXK—keep her busy, but

(*Continued on page 72*)

**Assistant Editor, CQ. Send all contributions c/o CQ 342 Madison Ave., New York 17, N.Y.*

Members of the San Diego Young Ladies' Radio League. From left to right, seated: Neva Fredenburg, W6YXI; Eleanor Baldwin, W6AWW; Peg Wells, W6BCU, treasurer; Peggy Mulligan, W6AQL, secretary; Mary Wehrmann, XYL-W6YTH; and Marion Alford, XYL-W6ZXK. Standing: Mercedes Lawrence; Ellen White, W6YYM, president; Jean Baptie, W6ZYD, vice-president; Blanche Weiss, W6BLF; Suze Grey, XYL-W6WNN; and Leone Simon, W6BGC. Missing are Mable Field, W6YZV; Margaret Kittel, XYL-W6ZCQ; and these new members: Shirley Lucks, XYL-W6OGY, and Betty McCoy, XYL-W6YXE.

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Hallicrafters S38	47.50
Hallicrafters S40A	89.50
Hallicrafters SX43	169.50
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Hallicrafters SP44	49.50
Hallicrafters HT18	110.00
Hallicrafters HT9	350.00
National NC57	89.50
National NC173	179.50
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National NC240D	225.00
National HRO-7	279.00
Hammarlund HQ129X	177.30
Hammarlund SPC400X	398.25
Hammarlund Four-20	120.00
Hammarlund Four-11	72.50
RME 84	98.70
RME 45	198.70
RME VHF152A	86.60
RME HF-10-20	77.00
RME DB22A	66.00
Collins 32V1	475.00
Meck T60	150.00
Signal Shifter model EX	99.50
Bud VFO-21	52.50
Millen 90800 exciter	42.50
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PARTS AND PRODUCTS REVIEW

NBFM Modulator Unit

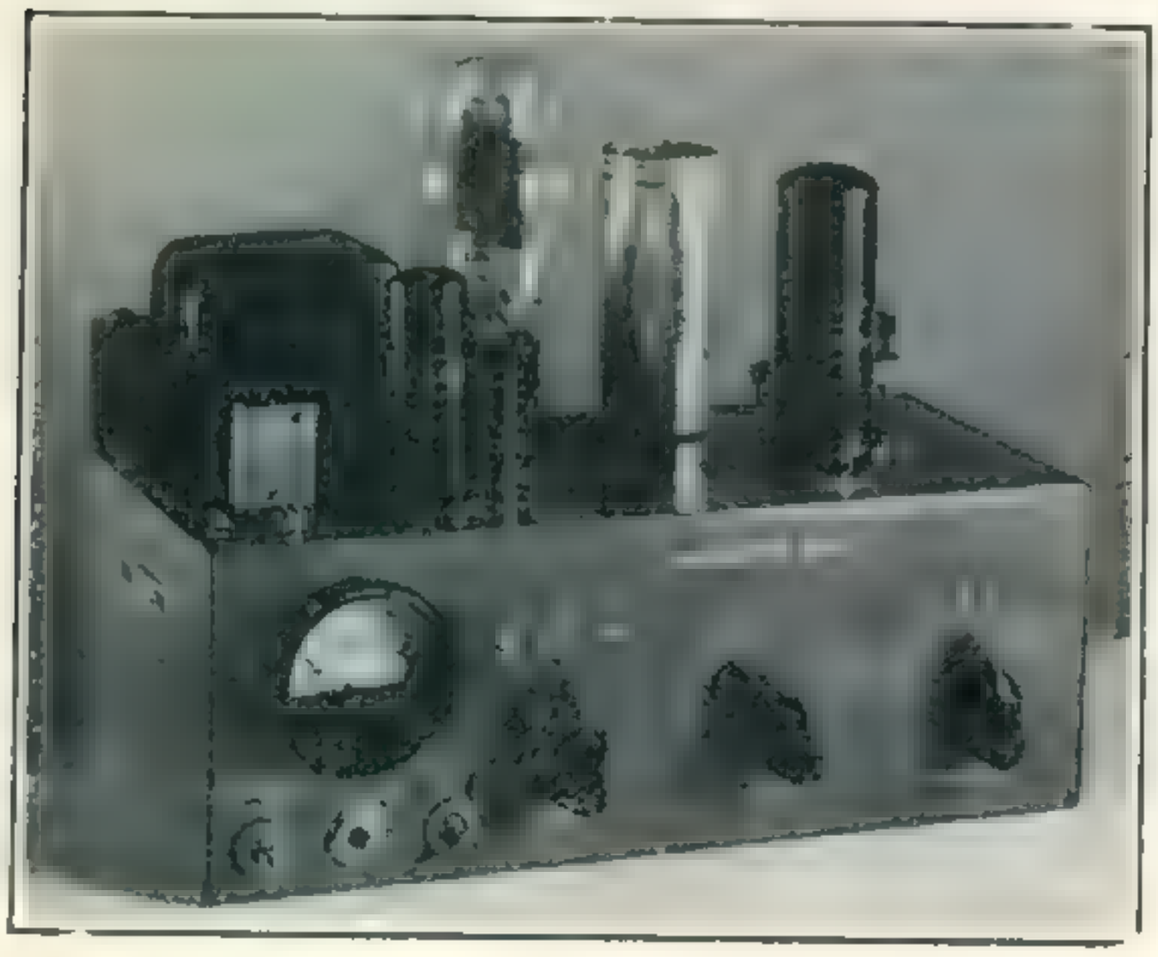
The new Bee-Bee NBFM Modulator Unit, Model 500, is a reactance type modulator designed for direct coupling to the v.f.o. or crystal socket of a conventional crystal-controlled pentode or triode oscillator. The Bee-Bee unit permits phone operation with any transmitter at full c-w ratings without expensive speech equipment. The unit is not an

exciter and does not eliminate or duplicate buffer or driver stages in existing transmitters. Complete details are available from Bee-Bee Electronic Co., 2692 W. Pico Blvd., Los Angeles 6, Calif.

Low-Power Transmitter Kit

Micamold Radio Corporation, Brooklyn 6, N. Y., announces the first of a line of amateur radio equipment, by releasing a c-w transmitter kit known as XTR-1.

The kit includes all parts and complete, clear instructions to assemble a well engineered transmitter that has many unique features, such as band switching, absolute safety, etc. The transmitter is rated at 45 watts input to the 6L6 final amplifier. Descriptive literature is available.



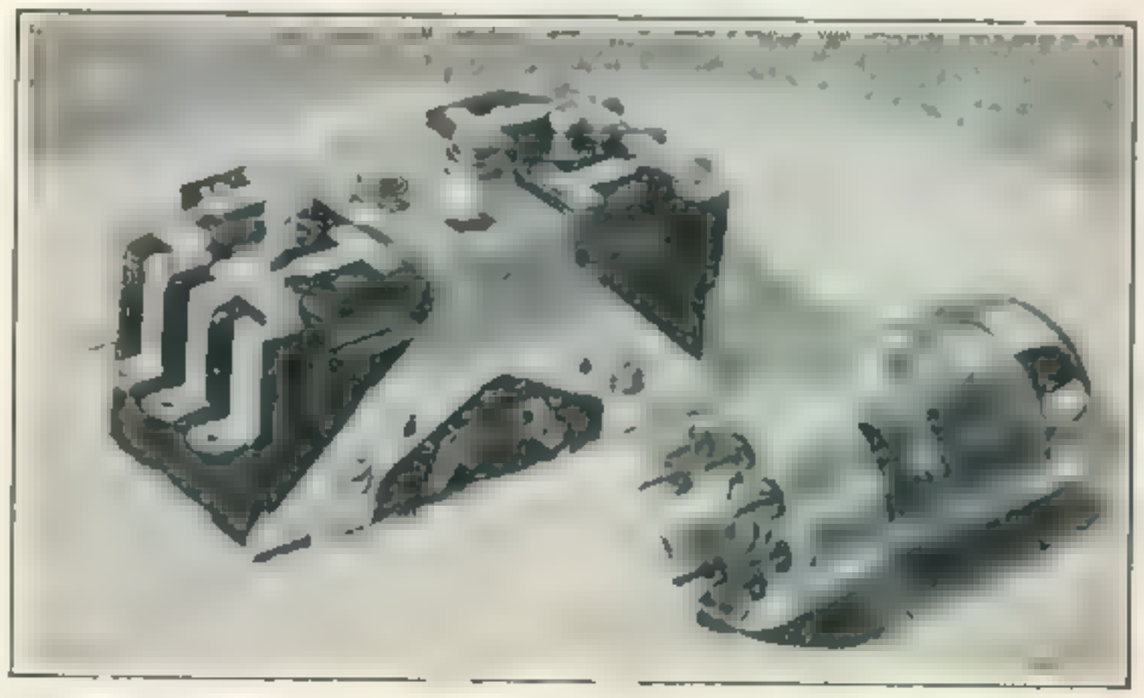
Broad-Band V-H-F Folded Dipole

A broad-band folded dipole designed for use as a receiving or transmitting antenna in the 85-mc to 150-mc range is being introduced by the communica-

tions equipment division of Heintz and Kaufman, Ltd.

The H-K dipole can be accurately tuned to any frequency within this range, hence it is adaptable for 2 meters. This antenna is designed for use with a 300-ohm ribbon transmission line. Parasitic elements for the construction of beam antennas will be made available through jobbers.

For additional information write Communications Equipment Division, Heintz and Kaufman, Ltd., 50 Drumm Street, San Francisco, Calif.

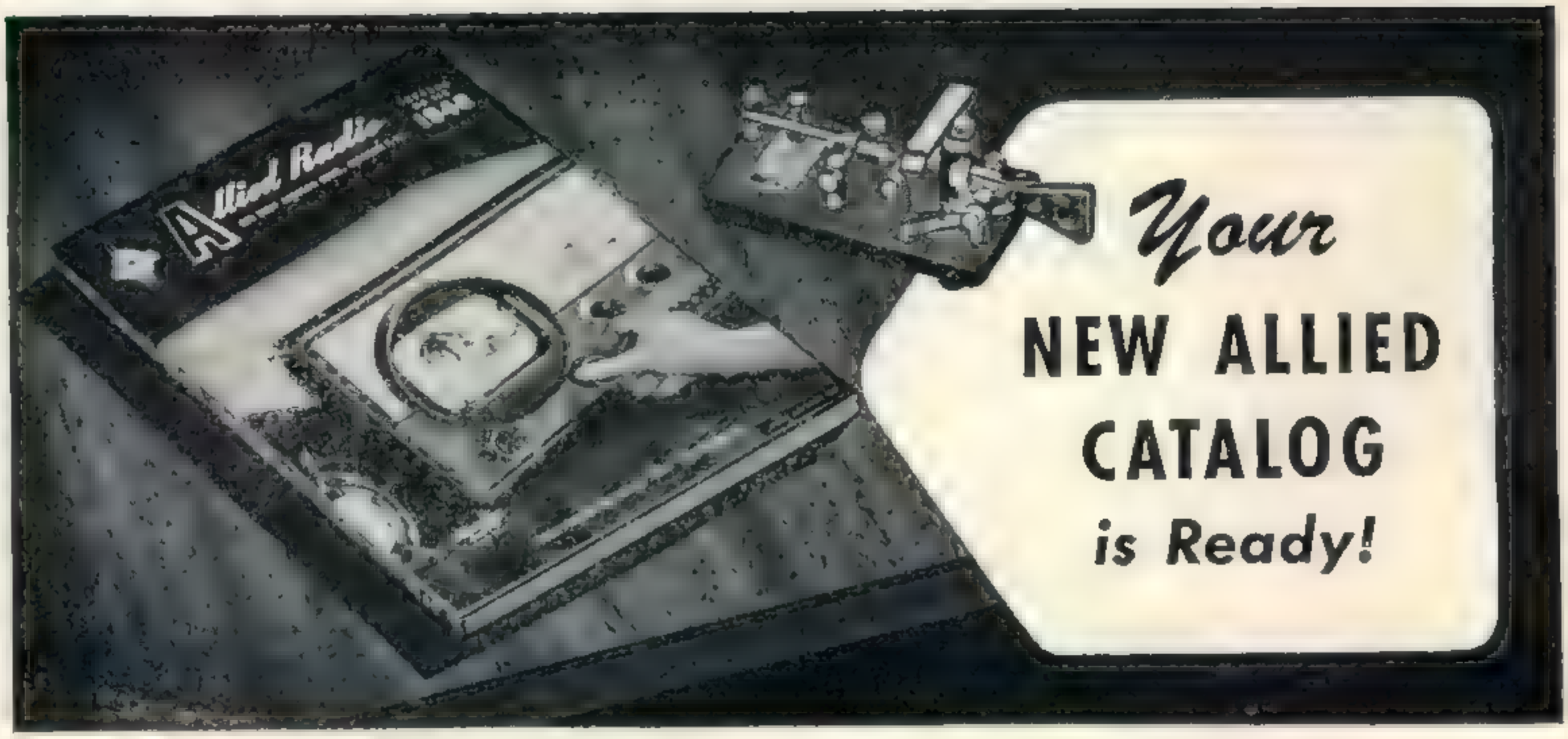


Versatile Latching Relay

Sigma Instruments of 70 Ceylon St., Boston, Mass., has announced a multicircuit switching relay (6FZ Series) of the latching type, designed to eliminate two principal weaknesses to which relays of the mechanical latch-electrical reset type are often prone.

Individual switch positions, of which there are eight, each of which may be normally open or closed, carry a nominal rating of 5 amperes at 110 volts a.c., or 24 volts d.c., although actual ratings vary with life requirements and character of load. Contacts may be ganged or arranged in pairs for a maximum of 4 double-break circuits. Coils, which operate from d.c. (or rectified a.c. supplied from a single midget selenium rectifier stack or any ½ wave circuit), require pulses of less than 0.5 watt for tripping, and are available with resistances from very low values up to 10,000 ohms. For some types

(*Continued on page 90*)



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Hallicrafters S-51....	$129.50	National NC-57.....	$ 89.50
Hallicrafters S-53....	79.50	National NC-173.....	189.50
Hallicrafters SX-43...	169.50	National NC-183.....	269.00
Hallicrafters SX-42...	275.00	National HRO-7.....	311.36

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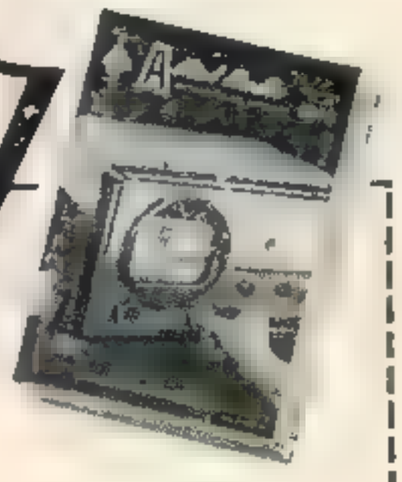

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Complete with one of each unit shown below Any experimenter or boat owner cannot be without this equipment which cost the Government thousands of dollars but offered you at the small price of....

$30.00

C-1 GYRO

$8.95

Part of the C-1 Auto Pilot which is sold separate and may be used to conduct many interesting and amusing experiments. Operates from 24 V. DC or may be operated for short periods on 110 V. AC. Gyro will run for approx. 15 minutes after actuating. Size—approx. 8" x 8½" x 8½".

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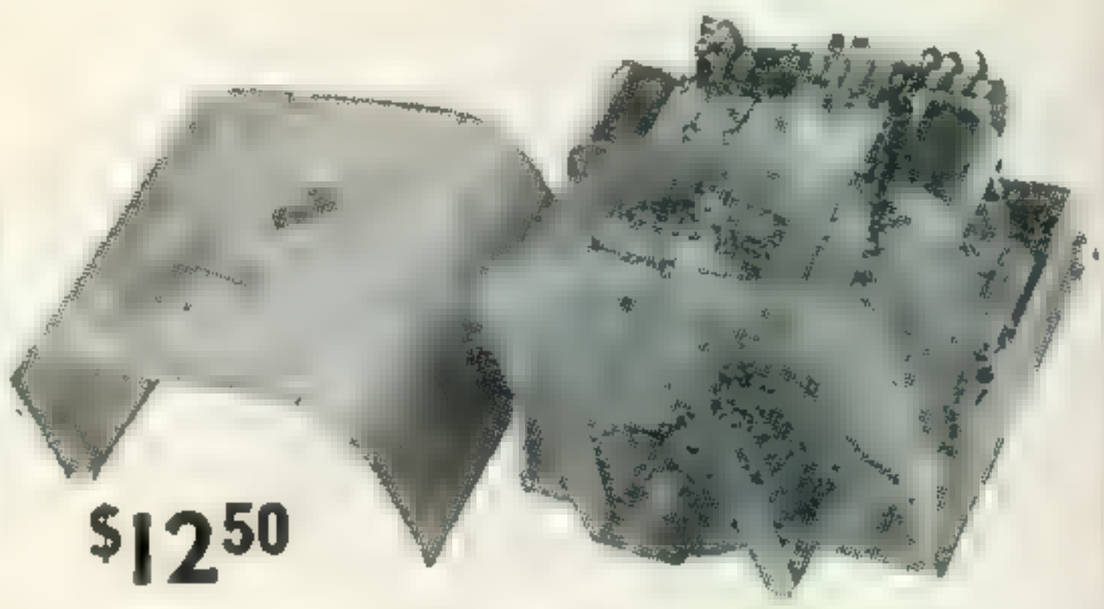

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Use to rotate beam antenna actuate boat rudder control, etc. Contains 24 V. motor, clutch, relays, etc Reversible. Size overall approx 10½" x 8½" x 6½"

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Used to control operation of servo unit in response to signals received from gyro unit and control unit. The complete amplifier includes one rect. 7Y4, 3-7F7's for amplification and control, 3-7N7's for signal discrimination, 1 power transformer, 6 relays, 4 control pots, chokes, condensers, etc. Convert for use on perates from 24 V. DC.

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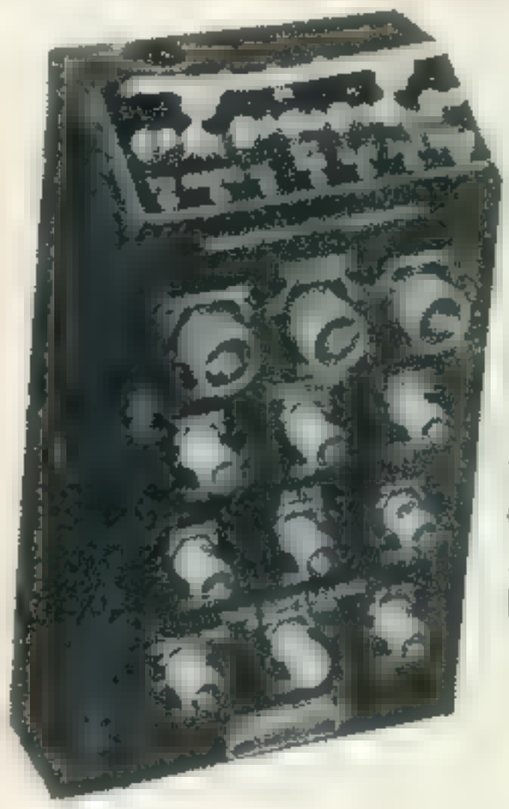

C-1 AUTO PILOT CONTROL BOX

Used for aligning control of C-1 Auto Pilot or use for parts, etc. Contains many useful pots, toggle switches, plugs, etc. Size, 11" x 6" x 4½"

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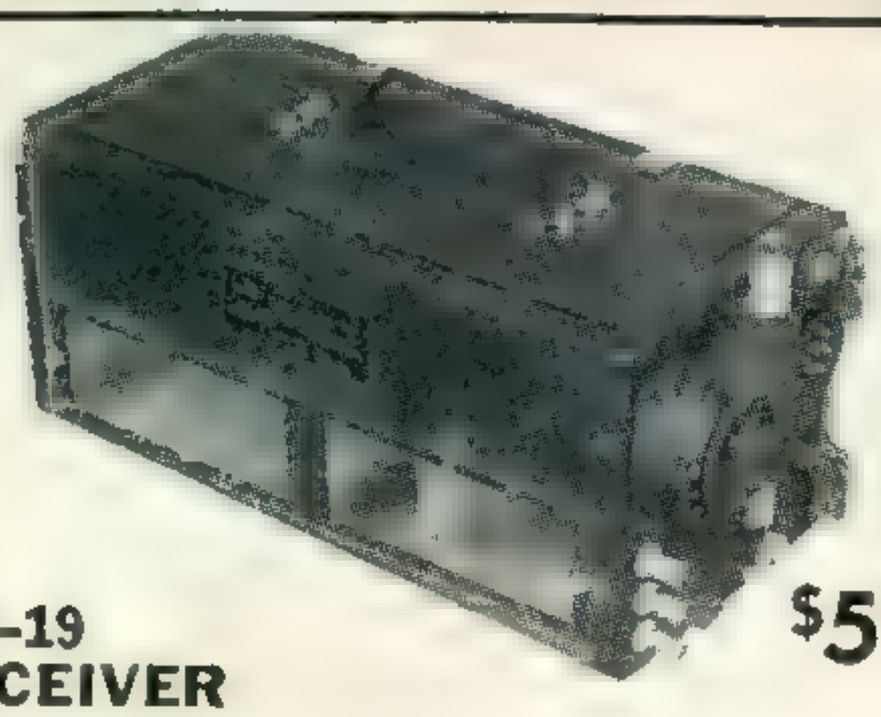

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With plug-in coils not included cover a frequency range of 195–13,575 Kc Contains 6 tubes Size, 6½" x 6½" x 15".

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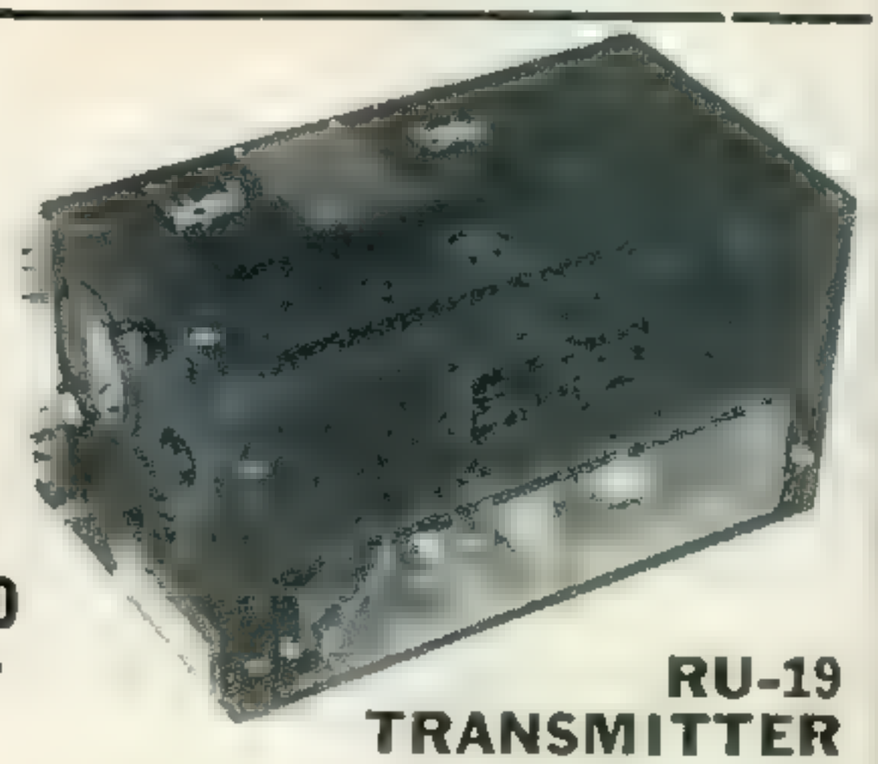

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Contains relays, toggle switch, potentiometer, etc. Complete with conductor breeze cable 9½ ft. long.

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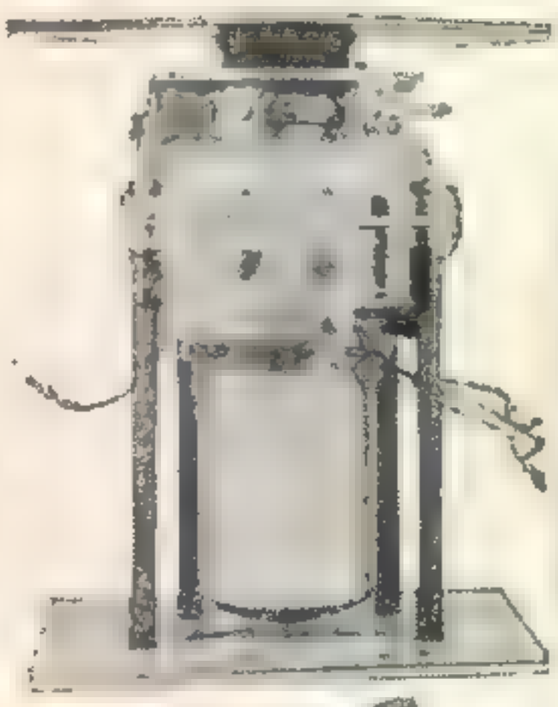

Used to rotate your beam antenna

Motor only, 24–28 V.

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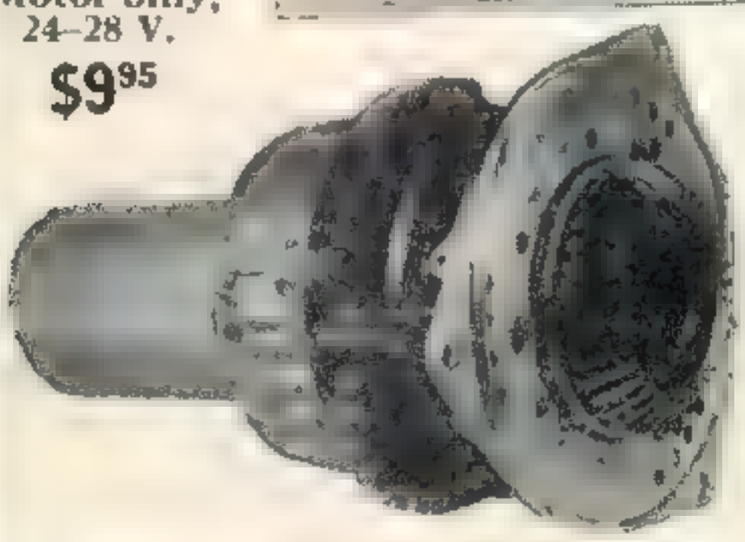
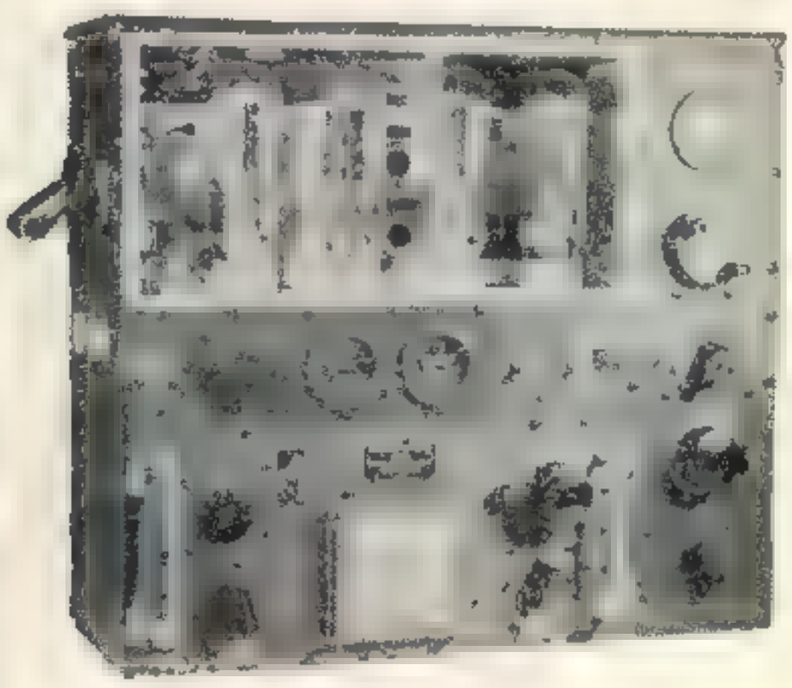


Trans. to operate 100 V.30 V. (New) $4.95



BC-375E GE Mopa Transmitter

With one tuning unit, choice **$15.00**

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(operates from 12-25 V 60 cy. AC supply)
5″ model $2.85
3″ model 2.85

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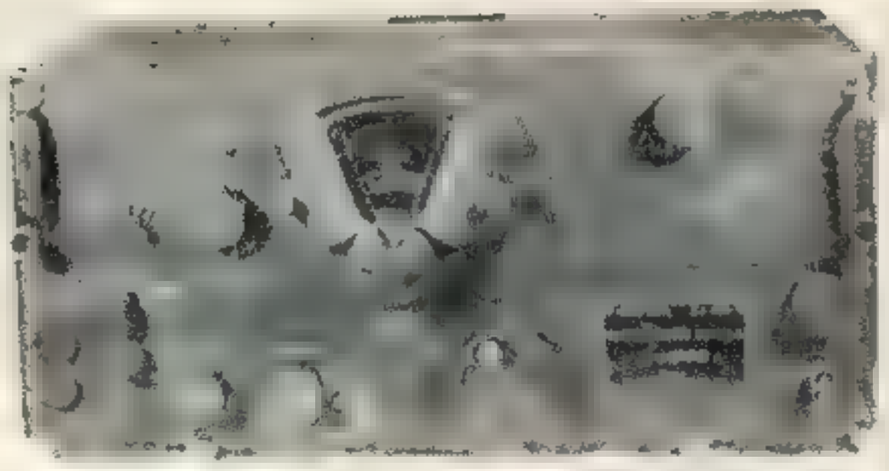
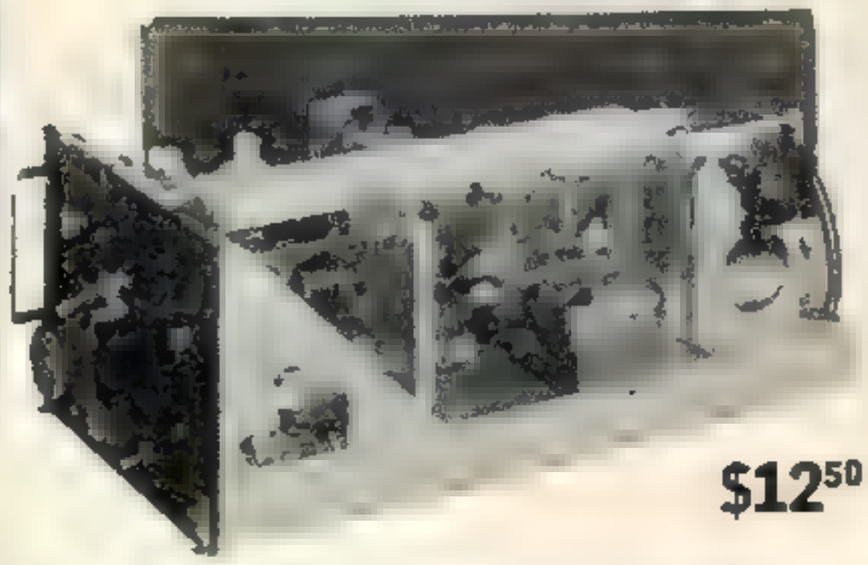
Used for parts or small phono amplifier shipped complete with the following tubes (2-7C5's, 1-7Y4, 1-7F4. Sold in carton lots only. 10 per carton.
Price . . . . . 75c ea.



BC-348 Communications Receiver $69.50

6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. dynamotor. These receivers have been thoroughly checked in our work-shop and found in excellent condition.
BC-348, 110 V. AC power supply, including simple conversion instructions. Complete with tube. **$8.95**

T-39/APQ-9 Radar Transmitter



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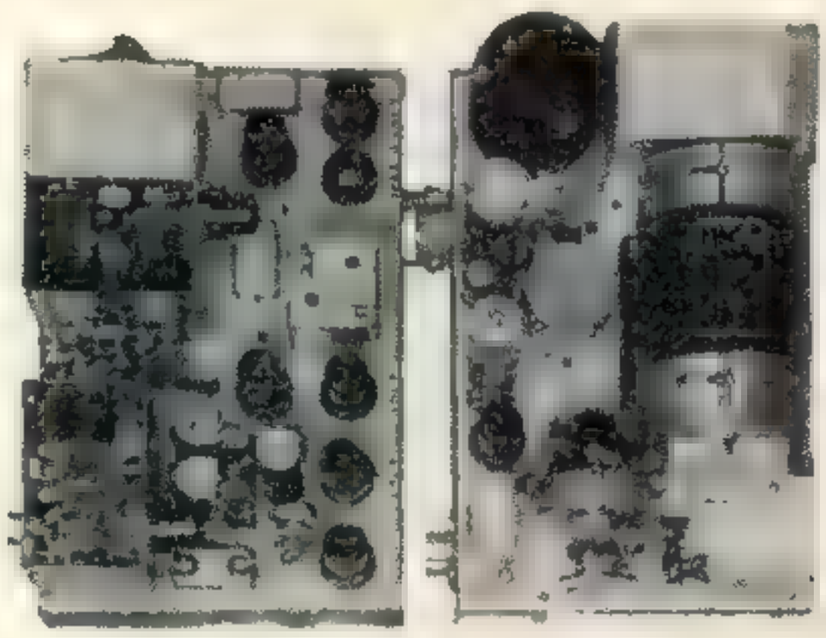
Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2-RCA 8012 tubes rated at full output to 500 Mc. Tubes are forced air cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2-6AC7, 1-931 and 1-6AG7 tubes) ceramic switch, potentiometers, gears, revolution counter, etc.



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Approximately 2 meter frequency operation. 14 tubes, 350 V. DC dynamotor 12 V. DC input. Contains voltage regulators and many other fine parts. Worth more for parts than price asked **$4.75**

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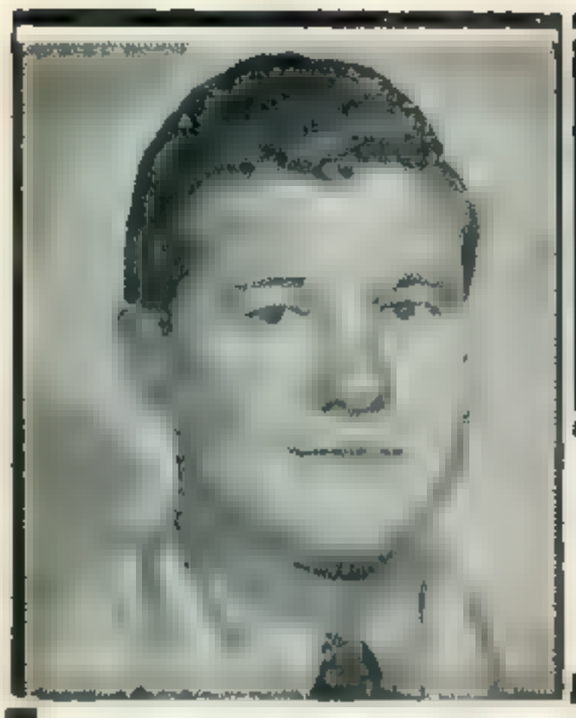

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MINE DETECTOR SCR-625

Brand New

ATTENTION: LUMBERMEN, PROSPECTORS, MINERS, PLUMBERS, OIL COMPANIES, ETC.

Below is a description of one of the finest metal detecting Mine Detectors ever built.

Operates in the manner of aural and visual method.

If you are looking for metal buried in logs, pipes in the ground, ore bearing rocks, underground cables, metallic fragments in scrap materials, metallic money buried or hidden in undetermined places this Mine Detector will probably surpass anything that was ever built. The United States Forestry Service has recommended procedure for using this detector to find concealed metal in tree logs and other timber products. Our government is reported to have paid several times the amount of our prices. They originally were sold by War Assets to jobbers for $166.00.

Unit consists of a balance inductance bridge, a two tube amplifier and a 1000 cycle oscillator. The presence of metal disturbs the bridge balance resulting in a volume change of the 1000 cycle tone. Tubes used are low battery drain types such as 1G6 and 1M5. The circuit may be modified for control of warning signals, stopping of machinery etc., when metal is detected.

Operates from two flashlight batteries and 103 v (B). However a power supply operating for 100 v may be used.

This unit is brand new and comes complete with spare tubes, spare resonator and instruction manual—in wooden chest 8¼ inches x 28¼ inches x 16 inches. Weight in operation is 15 pounds. Packed in original overseas container.

We do not know exactly what the deepest possible penetration would amount to when this detector is used but we have had customers who have bought the detectors with the expectations that the detector would locate metallic objects buried several feet under the ground or under water and we have had absolutely no complaints whatsoever regarding the detector not living up to the customers expectations.

We can not over emphasize our belief that if an Army surplus mine detector could solve your problems in detecting metal that this detector should fill the bill.

Our price is $79.50
Shipping Weight 125 pounds

NOTE: Batteries are not furnished, we can supply for $4.50 extra.

130–140 W. New York St.
Indianapolis, Indiana
March 1, 1948

Hello CQ:

By the way, Out There, Old Man Are you receiving your fair quota of radio gear? Untold tons of equipment have been shipped to your buddies all over the world.

As a matter of interest Our Friend, Max de Waard, QRA: Singel 162 Flushing, (Vlissingen), Holland, sent to Esse Radio Company some time back —a very long SOA (Sorrow on the airways) QSO stating the plight of his Dear Homeland Holland, his family and lastly but not the least, his self. Of all the things that were rationed in his country including bread, butter, milk, clothing, electricity, and practically all of the everyday needs of life including he said, even water; he missed his beloved hobby— radio, most of all.

It seems as if before the war Max had been an amateur licensed under the Holland radio network. The Germans came along and took with them all possible plunder or left in their wake all conceivable destruction. Then came the American Airforce with the Hell of night and day bombardment from the air. At times, my friend Max de Waard, shielded the body of his baby daughter with his own. Somehow, through it all, Max and his family managed to live. His town and countryside were torn and ravaged, flooded by waters from the broken dykes.

It seems as if our friend (I now say "Our" because I believe that my friend will soon become your friend) joined the Allied Armies as they landed in his country. When the War was over, this man and his family along with countless other families were left to decorate the American Soldier's graves and rebuild their homeland.

The purpose of our friend's letter to Esse Radio Company was to ask if a company "Which should surely be a Great Company," could possibly give him enough equipment to put him on the air so that he might tell the rest of the world of the horrors and hell of war.

Esse Radio Company has sent to Max de Waard a BC-654 and other merchandise prepaid and at no cost. We only hope that this man can, in a small way, use this equipment and do with it what he has indicated.

Esse gear has gone from one corner of the earth to the other and we are proud of incidents like the one that I have told you about in this letter and are proud of the friends that we have made and only wish that we were capable of helping more.

73's

Stan Selig

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8 mfd. 1000 V. Pyranol	2.00
4 mfd. 2000 V. Pyranol	3.00
1 mfd. 4000 V. CD	3.75

110 V. AC LEACH RELAY

Type 112-FR DPDT ..... $1.50 ea.

2-METER BEAM ANTENNA

Portable or fixed, manually operated or can be used with beam motor, for use in 100-156 Mc. band. Easily adapted for ham or experimantal use. Contains tuning unit which matches output of transmitter to antenna, 18' steel mast with brass tube containing co-ax cable and fittings inside steel mast (OD color), "H" frame for holding dipoles, 3 sets (4 per set) dipole rods, compensator or sense antenna for "H" frame, 2 steel truncated cones used as antenna support and feed-through, 360 degrees bearing indicator, and hand-wheel for rotating.

Brand new packed in six boxes, total weight approx. 600 lbs. Limited quantity and in much demand. Place order now.

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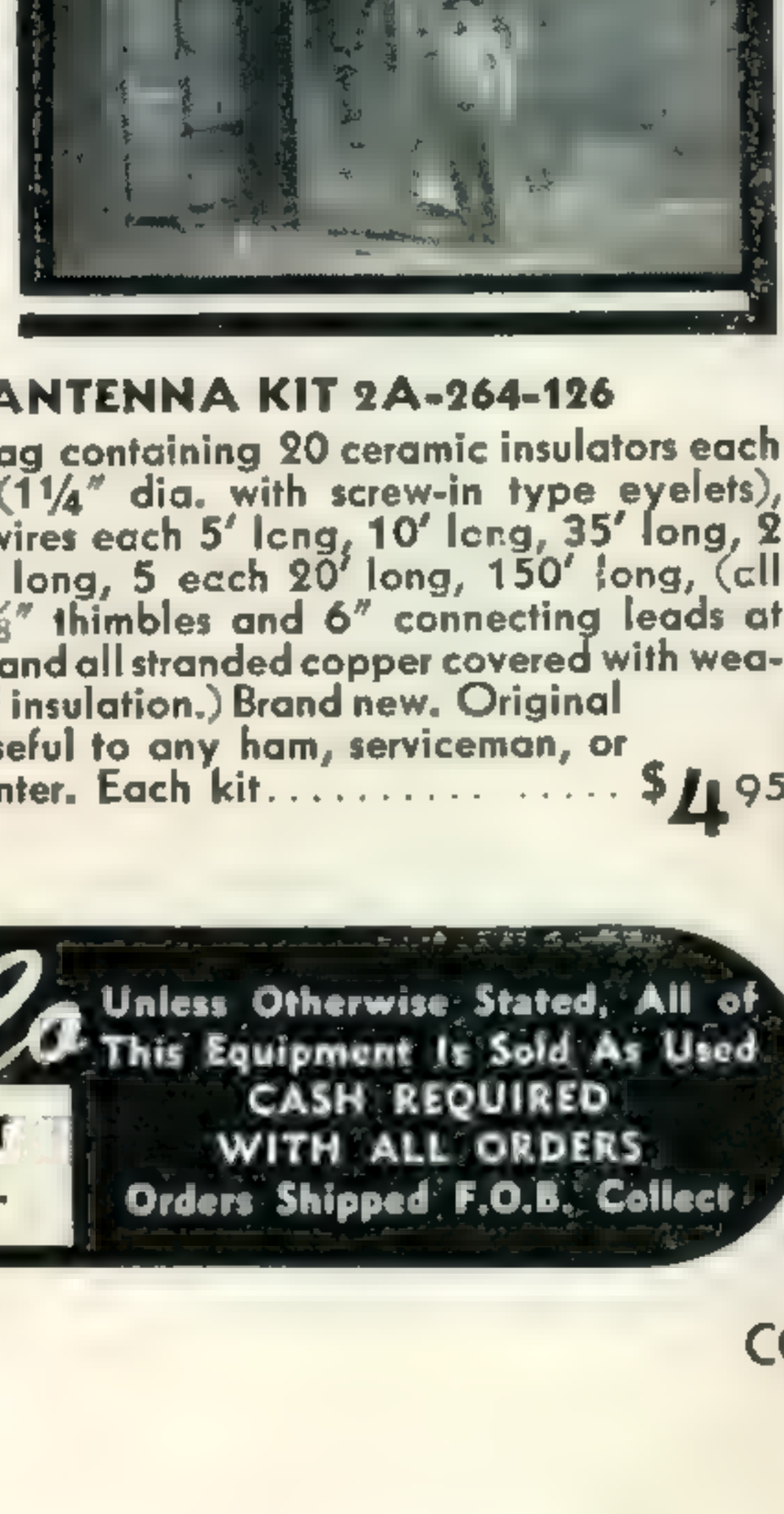

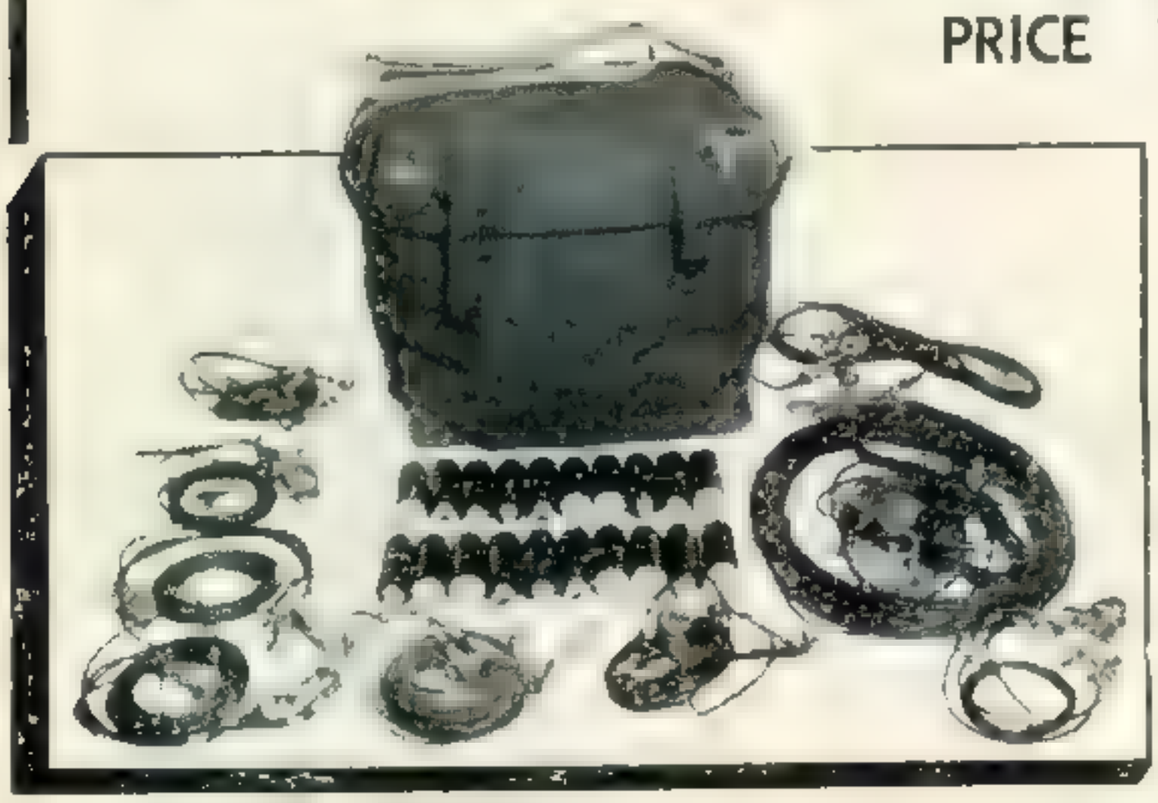

ANTENNA KIT 2A-264-126

Canvas bag containing 20 ceramic insulators each 3" long (1¼" dia. with screw-in type eyelets), covered wires each 5' long, 10' long, 35' long, 2 each 25' long, 5 each 20' long, 150' long, (all having ⅛" thimbles and 6" connecting leads at each end and all stranded copper covered with weather proof insulation.) Brand new. Original crates. Useful to any ham, serviceman, or experimenter. Each kit $4.95

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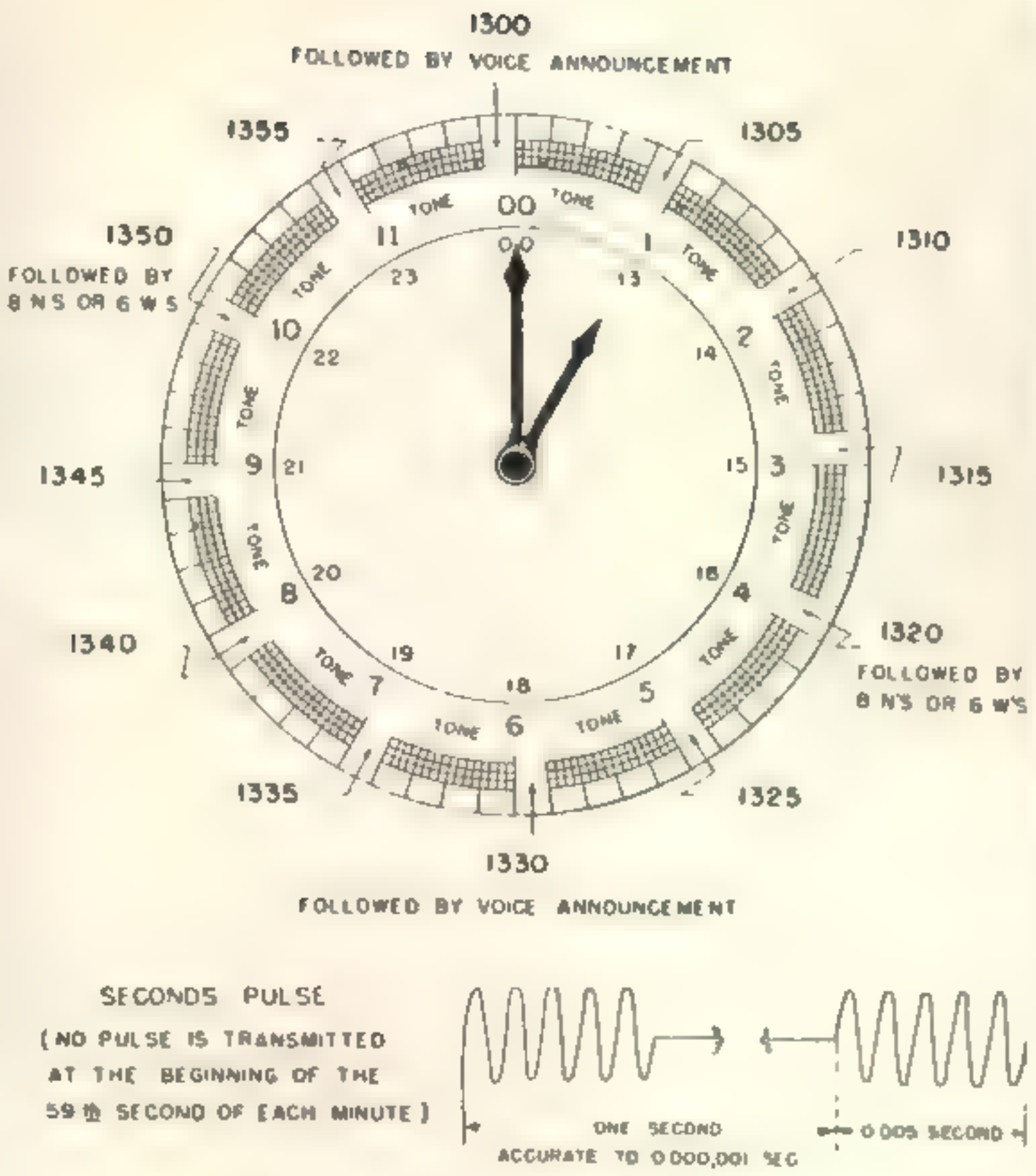

EFFECTIVE JANUARY 30, 1948, the technical broadcast services from radio station WWV of the National Bureau of Standards will be somewhat modified and improved.

Each of the eight radio carrier frequencies 2.5, 5, 10, 15, 20, 25, 30, and 35 megacycles will be broadcast continuously day and night. Standard audio frequencies of 440 and 4000 cycles per second will be transmitted on the carriers 10, 15, 20, and 25. The 440 cycle frequency, which is the standard of musical pitch (A above middle C), will also be broadcast on 2.5 and 5 megacycles. The accuracy of each of the transmitted radio and audio frequencies is better than one part in 50 million.

The attention of all users of the National Bureau of Standards time announcements is particularly called to the following change: Time announcements in International Morse Code, accurately synchronized with basic U. S. Naval Observatory time, will be advanced one minute with respect to the old announcement scheme. With the new system the audio frequencies are interrupted at precisely one minute *before* each hour and at each succeeding five-minute period. They are resumed precisely on the hour and each five minutes thereafter.

Under the old system, the time signals were interrupted for a minute on the hour and on each succeeding five minutes, while under the new scheme interruptions will be for a minute precisely on the 59th minute, on 4 minutes past the hour, 9 minutes past the hour, etc., and resumed precisely on the hour and each five minutes thereafter. The exact moment to which the time refers is the moment of interruption of the audio frequencies of 440 and 4000 cycles per second. The audio frequencies will continue to be interrupted for one minute to allow for the time announcement, for station identification by voice at the hour and half hour, and to afford an interval for checking radio frequency measurements free from the presence of audio transmissions.

WWV provides six important services: These are: (1) standard radio frequencies, (2) time announcements, (3) standard time intervals, (4) standard audio frequencies, (5) standard musical pitch, (6) radio propagation disturbance warning notices.

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Pictured are three of the smallest air variables ever produced. Each of the three types is available in four different capacities.

SINGLE TYPE—Takes the place of adjustable padders for trimming RF and IF oscillator circuits. Available in four models: 1.55 to 5.14 mmf, 1.73 to 8.69 mmf, 2.15 to 14.58 mmf and 2.6 to 19.7 mmf.

BUTTERFLY TYPE—Applicable wherever a small split stator tuning condenser is required. Available in four models: 1.72 to 3.30 mmf, 2.10 to 5.27 mmf, 2.72 to 8.50 mmf, and 3.20 to 11.02 mmf.

DIFFERENTIAL TYPE—For switching capacity from rotor to either of two stators, and for shifting tap on capacity divider. Available in four models: 1.84 to 5.58 mmf, 1.98 to 9.30 mmf, 2.32 to 14.82 mmf and 2.67 to 19.30 mmf.

For Full Details Write For Latest JOHNSON Catalog

E. F. JOHNSON CO.
WASECA, MINNESOTA

INDUCTIVELY COUPLED LOOPS

(*from page 47*)

Substituting these values in (4), and solving for M

$$600 = \frac{(2\pi \times 28.85)^2 M^2}{6}$$

$$M^2 = \frac{600 \times 6}{(2\pi \times 28.85)^2} = \frac{3600}{(181.5)^2}$$

$$M = \sqrt{\frac{3600}{(181.5)^2}} = \frac{60}{181.5} = .331\ \mu h$$

Referring to the curve of *Fig. 5*, it is seen that the 10" loops of *Fig. 3* would require a spacing of .69 inches to give a value of M equal to .331 μh.

At a frequency of 28.85 mc, the primary loop reactance was computed to be $+j101$ ohms (see *Section 4*). If a capacitive reactance of $-j101$ ohms is connected in series with the transmission line and the primary loop, the value of SWR is reduced to unity. On the other hand, if the 600-ohm transmission line is connected directly to the primary loop terminals, as shown in *Fig. 8b*, the value of SWR can be calculated as follows, by means of equation (9):

$$SWR = \frac{|600+j101+600|+|+j101|}{|600+j101+600|-|+j101|} = \frac{1205+101}{1205-101}$$

$$SWR = \frac{1306}{1104} = 1.185$$

In such a case, little would be gained in using a series capacitance for tuning out the primary loop reactance of $+j101$ ohms, since an SWR of 1.185 in the case of a 600-ohm line introduces negligible losses. Direct feeding is therefore recommended in this instance.

In *Table II* are given similar data for 3-element and 4-element arrays, at frequencies of 14.20 and 28.85 mc, using standard types of transmission lines and cables. Two values of standing wave ratio, SWR, are given: (1) for the case when the line is connected directly to the primary loop; and (2), for the case, where a series capacitance is used to tune out the primary loop reactance.

Referring to the values for 28.85 mc, it is observed that for lines having a characteristic impedance of 150 ohms or greater, the value of SWR is less than 2 when direct feeding is used. The loop spacings for the cases of the 50 and the 70-ohm lines are becoming quite large, and these lines, therefore, are not recommended for 10-meter operation. A minimum spacing of $\frac{1}{2}$" has been imposed on the loops of *Fig. 3*, because at this spacing a clearance of only 1/8" exists between the two loops. In fact, with this loop spacing, good mechanical alignment of the loops is mandatory, since any variation in spacing with beam rotation causes greater changes in mutual inductance than when larger loop spacings are used. The mutual inductance curve of *Fig. 5* clearly illustrates this feature.

The data for 14.20 mc show that SWRs of 2.15, or better, are obtained with 70, 150, and 300 lines when direct feeding is employed. The values of SWR increase for the cases of the 450 and the 600-ohm lines because of the $\frac{1}{2}$" spacing restriction. Under these conditions a corrective stub or reactance should be used if lower values of SWR than those shown are desired. If copper strap is used instead of the $\frac{1}{4}$" copper tubing of *Fig. 3*, spacings less than $\frac{1}{2}$" are possible, resulting in higher values of mutual inductance and lower values of SWR for

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Here's how we do it

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908	$1.50
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5FP-7	$1.75
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5HP-1	$2.45
5JP-1	$2.45
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This Months Special!

$4.95 each

5CR578 Gibson Girl Transmitter complete with tubes used but good, only $4 95

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PE 73 C Dynamotor Input 28 volts at 19 amps at 5000 RPM, output 1000 volts at 55 amps Used but good

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Desk Type Telephones with ope ate off flashlight cells or other small Batteries These of the Storage Batteries listed in the and operate a pair nicely Used but Excellent

Add 40c to cover Handling and Postage

Aircraft XMTRS. only $3.30 each

BC 457 A, 4 to 5 3 MC and BC 458 A 5 3 to 7 MC These transmitters are companion sets to the 453 4 and 5 receiver series They are used but in excellent condition It's really built rugged and makes an excellent 55 watt transmitter With tubes

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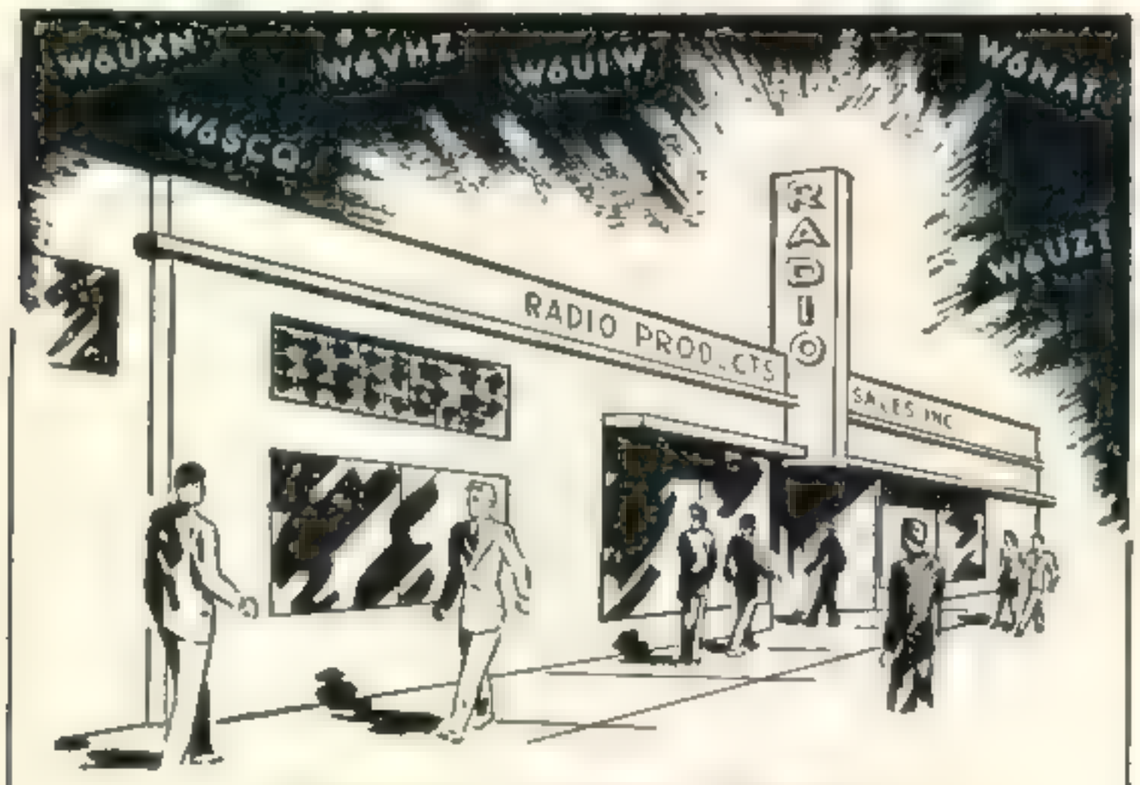
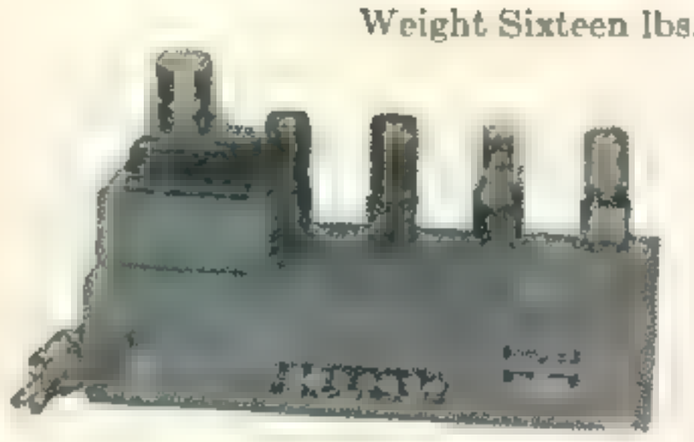
"Seven Acres of Surplus"



AUDIO AMPLIFIER CODE OSCILLATOR

Weight Sixteen lbs.



15 Watts Output

Uses 6SJ7GT, 6SN7GT-2-6V6GT 5Y3GT 117V 60 CY Input Output Impedance 2-4-8-16 500 OHMS

IDEAL FOR SPEECH AMPLIFIER USE. YOUR SPECIAL COST **$15.95**

Since this item is limited, we will sell on a "first come, first serve" cash basis only.

LEACH RELAY

D.P.D.T. — R. F.

¼" Pure Silver Contacts, 5 to 8 volts D. C.

Special . . **$.95** ea.

STANDARD COAXIAL PLUG

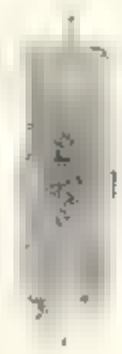
P. L. 259-A, Your Cost . **.29c**

Notice: Limit of 24 only to each customer.

MINIATURE I.F. TRANS.

5.3 MC. Slug Tuned, ¾" x ¾" x 1⅞" High. Complete set of 4 IF's, 3 Interstage and ONE DIODE.

Set of Four **$1.00**



Oil Filled Condensers

3 x 4 MFD. 600 Volts Working Rectangular can with brackets **$1.29 ea.**

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these cases. With a coupling coefficient of unity, the maximum possible mutual inductance is given by the square root of the product of the loop inductances, or

$$M = \sqrt{L_1 L_2} = L_1 = L_2 = .557\ \mu h$$

since L_1 and L_2 are equal. The actual value of M attainable will be less than .557μh, since unity coupling cannot be obtained. In any event, SWR can be reduced to unity by one of the methods shown in *Fig. 7*.

Resonating the Driven Element (Section 9)

All the computations and data given in *Tables I* and *II* are premised on the condition that the driven element circuit is tuned to resonance. In *Section 2*, it was pointed out that this circuit could be resonated in either of two ways: (1) by installing a condenser (or condensers) in series with the driven element and the loop, as shown in *Figs. 2a* and *7a*: or (2), by decreasing the length of the driven element sufficiently, so that its capacitive reactance exactly equals the inductive reactance of the secondary loop L_2. The second method possesses the advantages of lower cost and more simple construction. Some experimenters and amateurs feel that decreasing the driven element length to compensate for the inductance of L_2 impairs the efficiency of the array. The author, however, feels that the percentage decrease required is too small to cause any great decrease in array performance. In the case of a 10-meter beam and the 10" loops, each half of the radiator will have to be shortened from about 8' 2" to approximately 7' 0". This is an over-all decrease in length of a little over two feet, or about 12 to 13%. If condensers are used, they must be mounted in weatherproof boxes to protect them from the elements. The capacitance required, for the 10-meter band (28.85 mc), to tune out the $+j101$ ohms of L_2 is computed to be

$$C = \frac{10^6}{2\pi \times 28.85 \times 101} = 54.6\ \mu\mu f$$

This is the total capacitance required; if two condensers are connected in series as shown in *Figs. 2a* and *7a*, each one will have to be twice 54.6 $\mu\mu$f, or 109.2 $\mu\mu$f. These are practical values, and condensers of this size are readily available.

For 14.20 mc, the inductive reactance of the 10" loops is $+j50$ ohms (i.e., approximately one-half that at 28.85 mc), and the value of capacitance is calculated to be

$$C = \frac{10^6}{2\pi \times 14.20 \times 50} = 224\ \mu\mu f$$

which is approximately four times that required for the 10-meter case. If two condensers are to be used, the size of the individual condensers becomes 2×224, or 448 $\mu\mu$f. These are large condensers; and, for the case of 20 meters, this method does not seem very practical. The antenna length might be made too long so as to increase the inductive reactance, then condensers of lower capacitance (i.e., higher reactance) can be used to resonate the circuit. In the 20-meter case, the loop reactance is only $+j50$ ohms, and the percentage of shortening of the driven element required for resonating the circuit is approximately one-half that required in the 10-meter case. For example, half-wave resonance for 14.20 mc occurs roughly at a length of 33 feet, with a half-length of 16.5 feet. The half-length will have to be decreased from 16' 6" to about 15' 6", which is roughly a 6 to 7 per cent decrease in length, as

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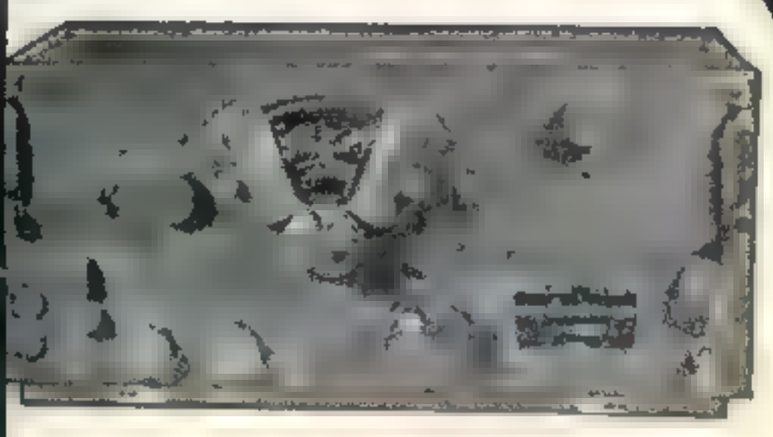

BC-348

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Excellent selectivity, sensitivity and stability makes this the most outstanding of any receiver yet available from government surplus. This receiver will give outstanding performance wherever used. Built to withstand vibration and features gear driven 100-1 ratio vernier tuning control. Six bands—500 Kc. and 1.5-18 Mc. Two stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. DC dynamotor. Easily converted to 110 V. AC operation.

BC-348, 110 V. AC power supply, including simple conversion instructions.....$8.95

$69.50

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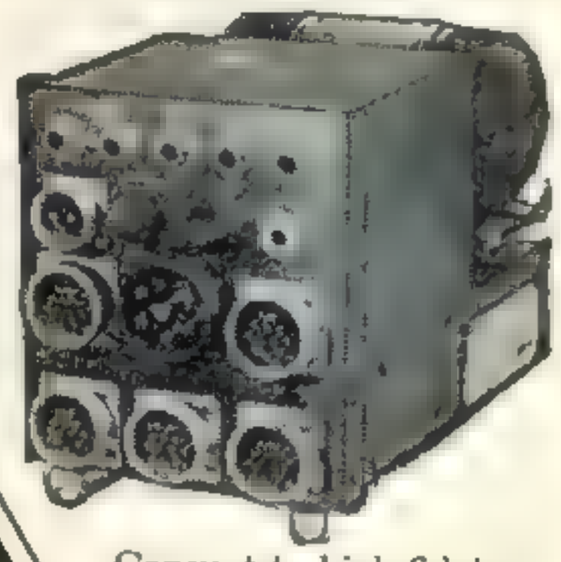

Convert to high fidelity phone Amp. or speech Amp. Complete with tubes and dynamotor, for 24 V. DC operation. Used but in good condition.

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BRAND NEW SCR-625 MINE DETECTORS

ATTENTION, PROSPECTORS, MINERS, OIL COMPANIES, PLUMBERS, ETC.

Used by the Army to detect buried metallic mines. Its private use suggests the location of underground or underwater pipes, cables and ore-bearing rock, the location of metallic fragments in scrap materials, logs, etc., and the screening of personnel in plants for carrying of metallic objects. New, complete in original overseas packing container. Originally sold by War Assets for **$166.00.** The U. S. Forestry Service has recommended procedure for using the SCR-625 Mine Detector to find concealed metal in tree logs and other timber products.

$79.50

AIRCRAFT TRANSMITTER BC-457A or BC-458A

Ideal to make over for master oscillator. Priced complete with tubes. Has built-in crystal for dial calibration. Used but good condition. 5.3 - 7 MC or 4 - 5.3 MC.

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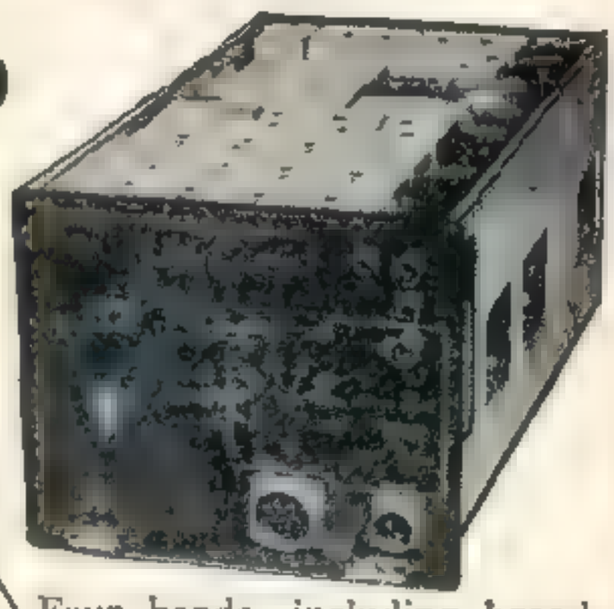
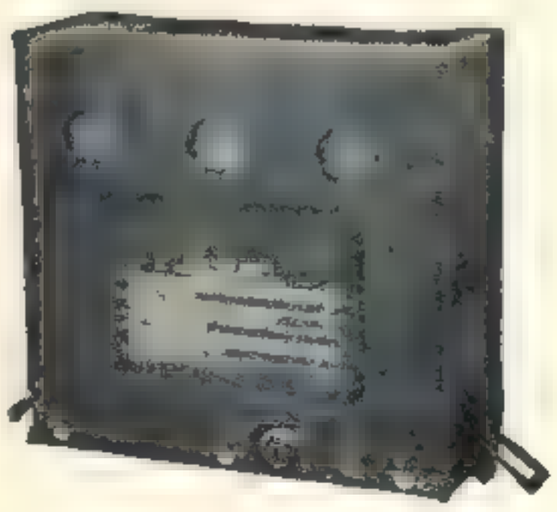
NAVY CRV-46151 AIRCRAFT RADIO RECEIVER

$19.50 INCL. CASE



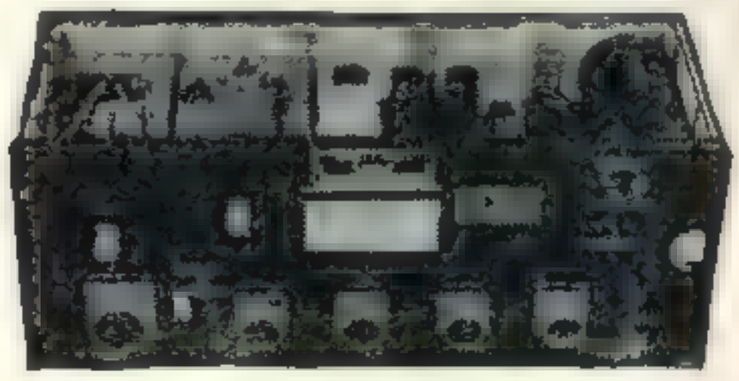
Four bands, including broadcast (195-9,050 KC). Circuit is six-tube superheterodyne with mechanical band change or remote operated electrical band change. Remote band change and tuning controls included, making this set readily adaptable to mobile ham use. Powered from self-contained 24 V. DC dynamotor. The sets are complete with tubes, mounting rack and remote controls.

New WILLARD RECHARGEABLE STORAGE BATTERIES



New 6 volt battery in spill-proof clear plastic case, housed in metal case for easy mounting. Applicable for a wide range of uses where battery power is needed. Shipped dry. Uses standard battery electrolyte available everywhere.

Price each	$4.00
Lots of Ten	3.35
Without metal case, each	3.00
Lots of Ten	2.85



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A complete 460 mc. radio receiver and transmitter which can be converted for ham or commercial use. Tubes used and included: 4-12SH7, 3-12SJ7, 2-6H6, 1-VR150, 2-955, 2-9004. Other components such as relays, 24 V dynamotor, transformers, pots, condensers, etc., make this a buy on which you can not go wrong. Complete as shown in aluminum case 18"x7"x 7¼

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compared to 12 to 13% for the 10-meter case.

One procedure for resonating the driven element circuit is to shock excite it by means of a half-wave antenna located about 30 to 50 feet away and parallel to the radiator, as shown in *Fig. 8a*. (This same half-wave antenna can be used later for making the final tuning adjustments to the completed beam.) The transmission line should not be connected to the primary loop during this adjustment. Now resonate the radiator circuit by either varying the radiator's length or by adjusting condensers *C* of *Figs. 2a* and *7a*. Resonance can be identified by noting the reading of the r-f ammeter M_2, which is connected in series with the loop L_2 and the driven element; the circuit is in resonance when the reading of M_2 is a maximum.

If it is not convenient to connect M_2 into the loop circuit, use a separate pickup loop L_3 (*Fig. 8a*), condenser C_3, and r-f ammeter M_3, and place the loop near the radiator loop L_2, as shown in *Fig. 8a*. The circuit L_3C_3 can be previously resonated by holding it near the power amplifier tank circuit of the transmitter and adjusting it for maximum current in M_3. If this is done, then the circuit will not couple any reactance into the driven element circuit when it is used as a resonance indicator. Now place L_3 near L_2 so it will pick up energy from this circuit; then tune the driven element circuit until M_3 indicates a maximum current. (If an r-f ammeter is not available, use a d-c milliammeter with some sort of rectifier—such as a 1N34 crystal or vacuum tube.)

A third method of detecting resonance in the driven element circuit is shown in *Fig. 8b*, in which the r-f ammeter, M_4, is clipped across a small section of the loop L_2, by means of alligator clips, or some similar device. The circuit can be energized by either its own transmission line through L_1 as shown in *Fig. 8b* or by shock excitation, as in *Fig. 8a*. This method is the most simple, since it eliminates the necessity for opening up the radiator circuit for inserting the r-f ammeter or of using an external loop circuit. When the circuit has been resonated, connect the transmission line and then adjust the parasitic elements in the usual manner

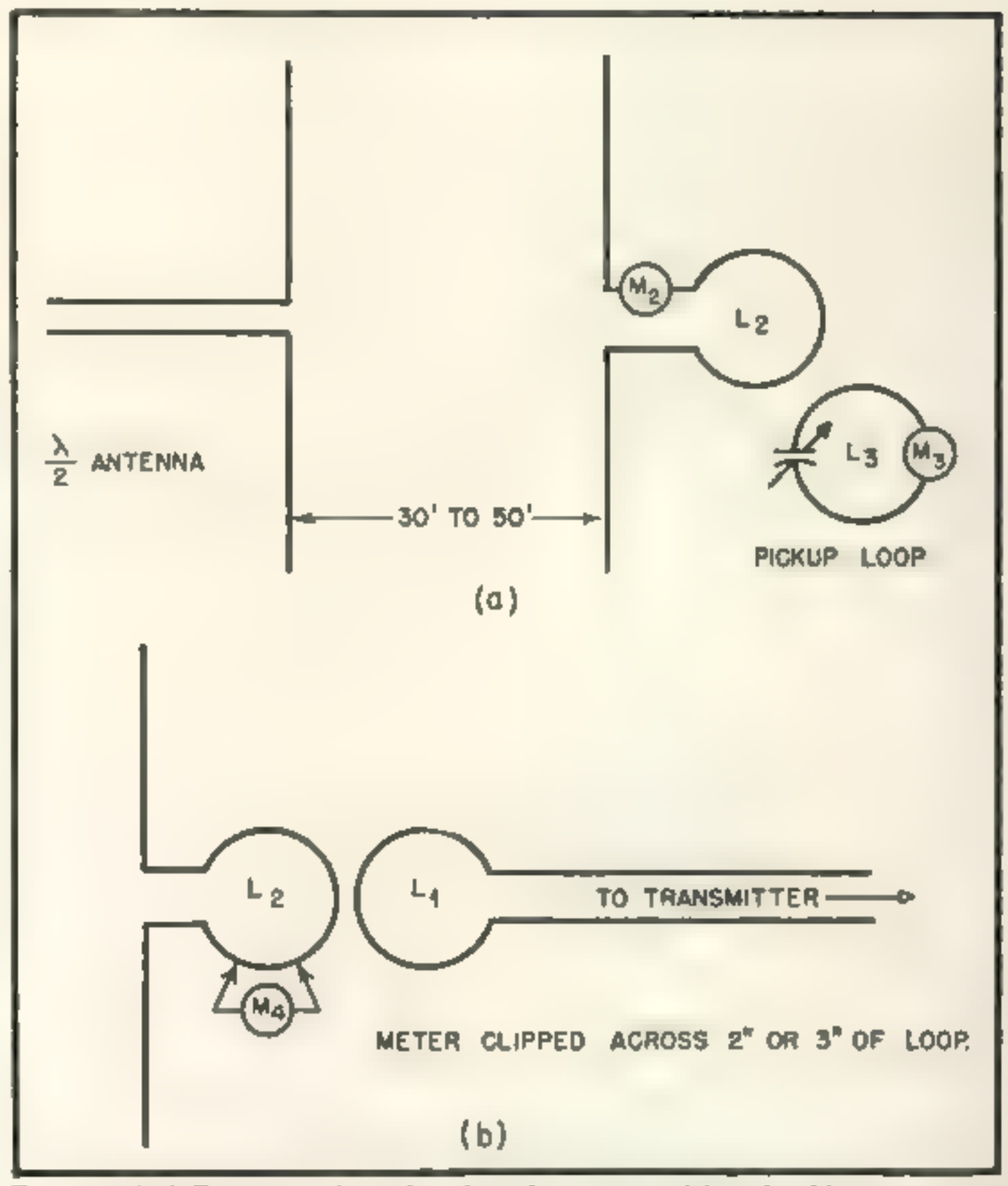

Fig. 8. (a) Driven dipole shock excited by half-wave antenna. (b) Driven dipole energized from primary loop L_1.

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Harvey-WELLS TBS-50 TRANSMITTER

America's Most Versatile Small Transmitter

50 WATTS-8 BANDS-PHONE OR CW

NO PLUG-IN COILS

80, 40, 20, 15, 11, 10, 6 and 2 METERS

(Completely wired and tested—not a kit)

Crystal controlled on all bands, yet requires no oscillator or multiplier tuning. Serves equally well for fixed station or mobile operation. TBS-50 may be mounted on rack panel with power supply.

TUBES: 6AQ5 Crystal Oscillator, 6AQ5 Buffer-Multiplier, 807, Final Amplifier, 2-6L6 Class B Modulators. In sturdy steel cabinet, 8" wide by 12" high by 8" deep. **TBS-50** Complete with tubes..... $99.50

SEE IT AT YOUR SUPPLY HOUSE TODAY

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POWER SUPPLY for TBS-50

No. APS-50 A.C. Supply with a "HI-LO" switch delivering either 425 volts or 300 volts at 275. ma. and 6.3 volts at 4. amps. Price..... $39.50

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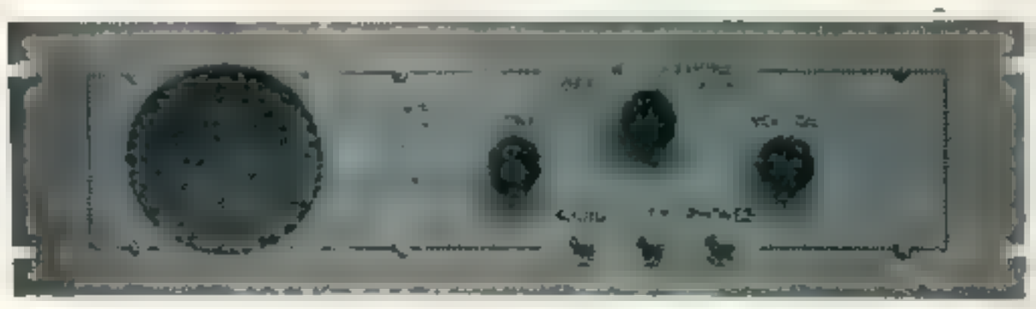
and the STATION MONITOR, SM-1



Provides audio note for monitoring any CW Transmitter. No tuning or band switching required . . . Provides phone monitor with speech amplifier . . . Has 4" PM Speaker, phone jack and built-in power supply. Price incl. tubes..... $34.75

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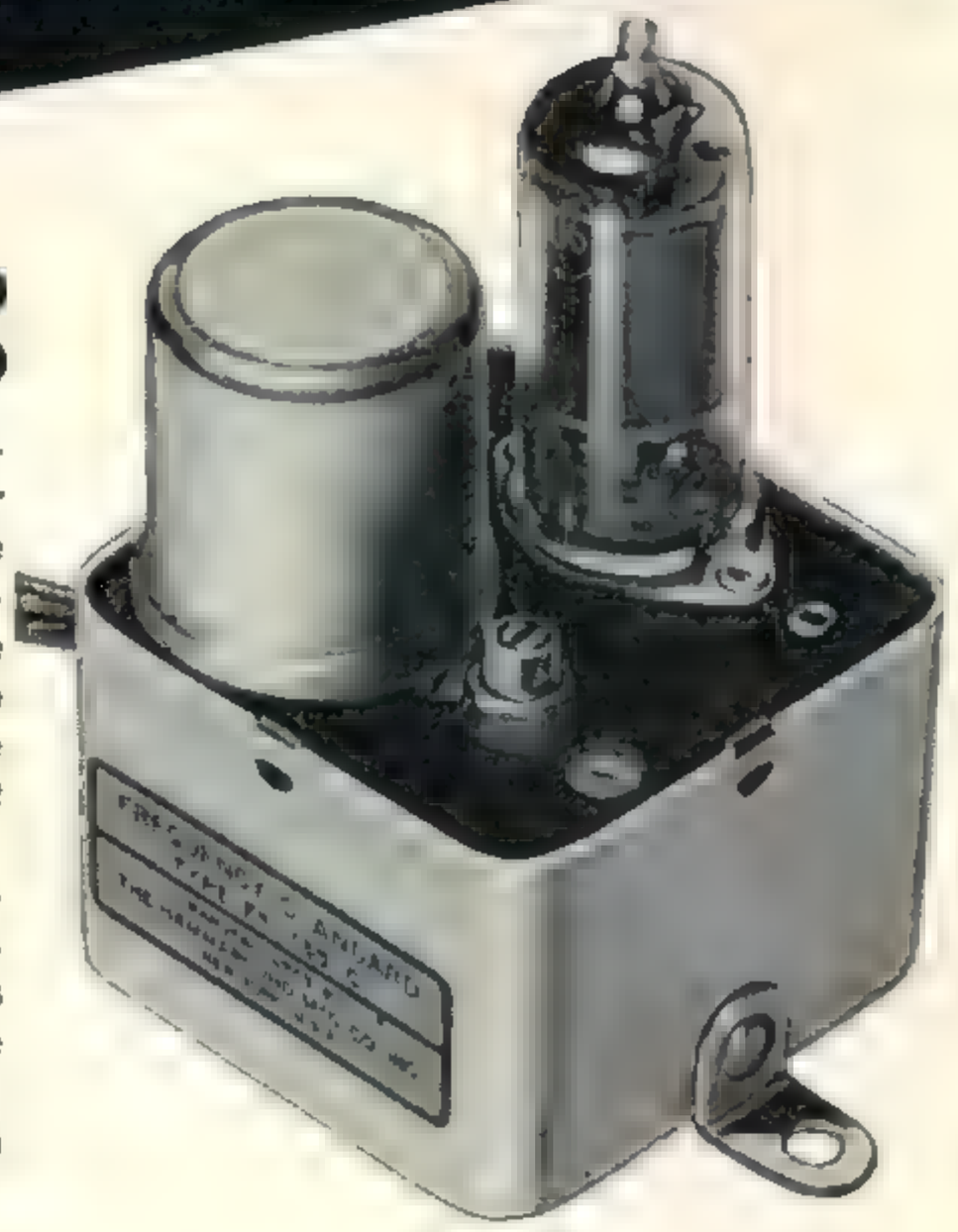

HAMMARLUND FS-135-C FREQUENCY STANDARD

With the FS-135-C, your receiver becomes an accurate frequency meter. The special 100 kc crystal generates marker signals every 100 kc throughout the entire range of the receiver. You can calibrate your receiver, check your transmitter frequency, or make any other checks required. The crystal frequency can be adjusted for zero beating with WWV and once this has been done the accuracy of the unit equals that of a costly frequency standard. The unit is so small it can be mounted in any receiver.

Specifications: 100 kc low-drift, silver-plated crystal, completely sealed; voltage requirements, filament 6.3 A.C., plate, 150-250 volts D.C.; consumes: filaments 300 mils, plate less than 2 mils; measures 2 by 2 by 3⅜ inches high. Complete with instructions, tube and 100 kc crystal.

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Brand New 6AU6G tubes.
Order a spare for the FS-135-C..... .65c

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Special 8 mc. xtals for 2 meter xtal control, only.....$1.50
Also in stock complete line of Bliley AX-2 xtals. Include 10¢ postage with your crystal order.

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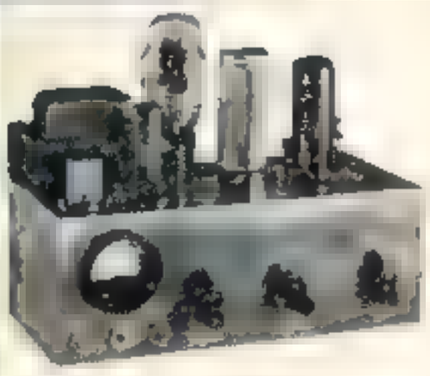

Micamold 45-watt CW Xmittr Kit. All parts with punched and lettered chassis; crystal control, band switching for 20, 40, 80; excellent design for operation and safety; stable circuit with pi network to match any antenna; only tubes, crystal and key needed to put in operation. Uses 83, 6AG7 and 1614/616 ..... **$34.00**

Type 1616 tube; Half wave, high vacuum rectifier. Filament 2.5 volts, 5 amps; peak inverse 5500 volts; peak current .8 amps; surge current 2.5 amps; average plate current .130 amps. List price $7.50, **Harvey special price, while they last.....95¢**

New, Surplus Meters
Simpson 2" 0-1 mil D.C. **$2.95**
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RCA Sound Powered Phones of type originally used by Navy for fire control direction, general communication, etc. These phones will easily feed thru 2000 ft. any type 2-conductor wire or cable. Can be used for a number of jobs such as between television antenna and receiver or transmitting antenna and transmitter for adjustment or directional control. Also between shack and XYL, farmhouse and barn or any other job requiring clear voice communication. No batteries or external power of any kind required. These units are absolutely **Brand New in original cartons. Each.... $15.00; per pair.....$24.50**

Signal Corps RA-20 Power Supply designed for installation in the BC-312-314 receivers. Fits in space now occupied by dynamotor. Operates on 110-120 volts, 60 cycle A.C. Can be used for many other purposes; supplies 12 V. A.C. and D.C. plate voltage.
Complete with 5Y3/GT. **Brand New**..... **$9.95**

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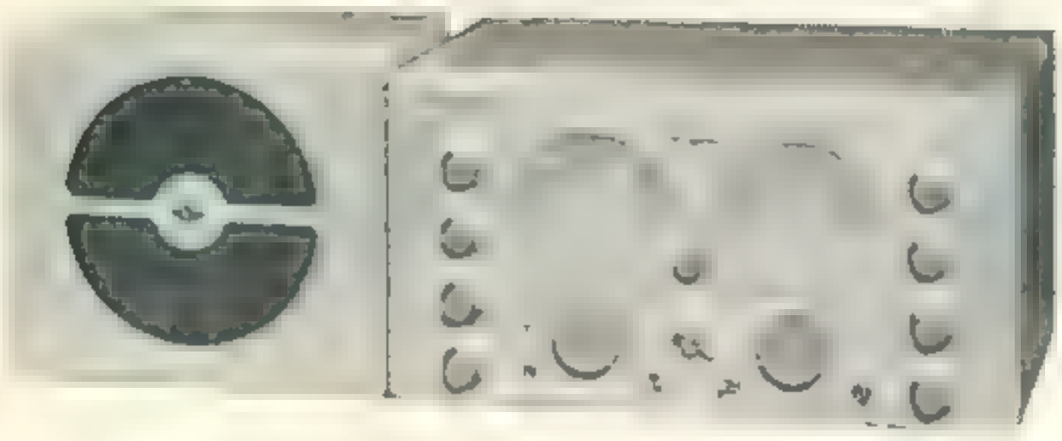

- **newest circuit design**
- **adapts for NBFM**
- **quality engineered inside and out**

6, 10–11, 20, 40 and 80 meter bands; 2 RF stages on all. "Double-diode" noise limiter. 6 steps of selectivity. S-meter with adjustable sensitivity for phone and CW. 8-watt audio output. Phono attachment; tone control. 10" speaker. Range: 0.54–31 mc. plus 48–56 mc. 14 tubes plus rectifier and voltage regulator.

Net, with 10" speaker. . . . **$269.00**

NFM-83 Adaptor.....**$16.95**

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MODEL TBS-50

HAM RADIO XMITTER

- **50 watts—no plug-in coils phone or CW-8 bands**
- **crystal controlled on all bands—no oscillator or multiple tuning**
- **fixed station or mobile operation—operates from A.C. pack or dynamotor**
- **also may be used as an exciter when increasing output**

Uses 6AQ5 Crystal Oscillator 807 Final Amplifier
6AQ5 Buffer-Multiplier 2-6L6 Class B Modulators

Band switch gives you 80, 40, 20, 15, 11, 10, 6 and 2 Meters

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K10454-Converter kit, incl. 6 m. coil pts., less tubes $34.50
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THE YL's FREQUENCY

(*from page 56*)

she manages to be active on 10 phone. She holds the first W6 re-issue call in the club—"A Quaint Lady."

Leone Simon, is W6BGC—a call which though old, is new to her. Her OM is W6ESN. Leone has taken over the job of writing up the club paper.

Mary Wehrmann, XYL of W6YTH, has been busy with a new jr. op and spent the holidays in the East with her family. But now she's back again plugging away at code and theory.

Blanche Weiss is one of the gals who most recently experienced the thrill of getting her ticket—W6BLF. Blanche, though busy with her jr. ops, never fails to get to the meetings. Her OM is W6VCD.

Peg Wells, W6BCU, is club treasurer. Peg deserves a vote of congratulations, for even with four kids to worry about she came through with a call of her own (and a good one, too—"Be Cee-ing U"). Her first night on the air she worked two Js. OM is W6WUW.

Ellen White, W6YYM, is the XYL of W6YYN. She is president of the SD YLRL and secretary of the SD Amateur Radio Club. Ellen prefers c.w. to phone and works in the 40-meter YLRL net, and SD AEC 40-meter net. Says she still misses the NYC YLRL (she was formerly W2RBU).

The two newest members to join the club are Shirley Lucks, XYL of W6OGY, and Betty McCoy, XYL of W6YXE. We know there will be many more for these YLs seem to have a really live-wire club.

YLRL Doings

Winners of the YLRL Christmas Party On-the-Air, held early last December, are: 1st, Annette Thompson, W4LKM (operating her OM's station, W4CWV); 2nd, Lou Littlefield, W1MCW; 3rd, Lily Mae Hester, W7KAE.

The next YLRL contest will be the On-the-Air QSO Party Feb. 26–29 (Leap Year celebration) between members of YLRL. It is the climax of the 3-month membership drive and scores made in the QSO Party will be added to points derived in the membership drive, with substantial prizes going to the winning D/C and high scorers on both phone and c.w.

A new address change for YLRL Secretary Louise Willomitzer, W6VWR: 515 S. 3rd Ave., Arcadia, Calif.

YLRL is proud of its youngest member, 14-year-old Jane Hodgson, W4MKP, of Miami, Fla. We'd all like to know—is Jane the youngest YL licensed operator in W- land?

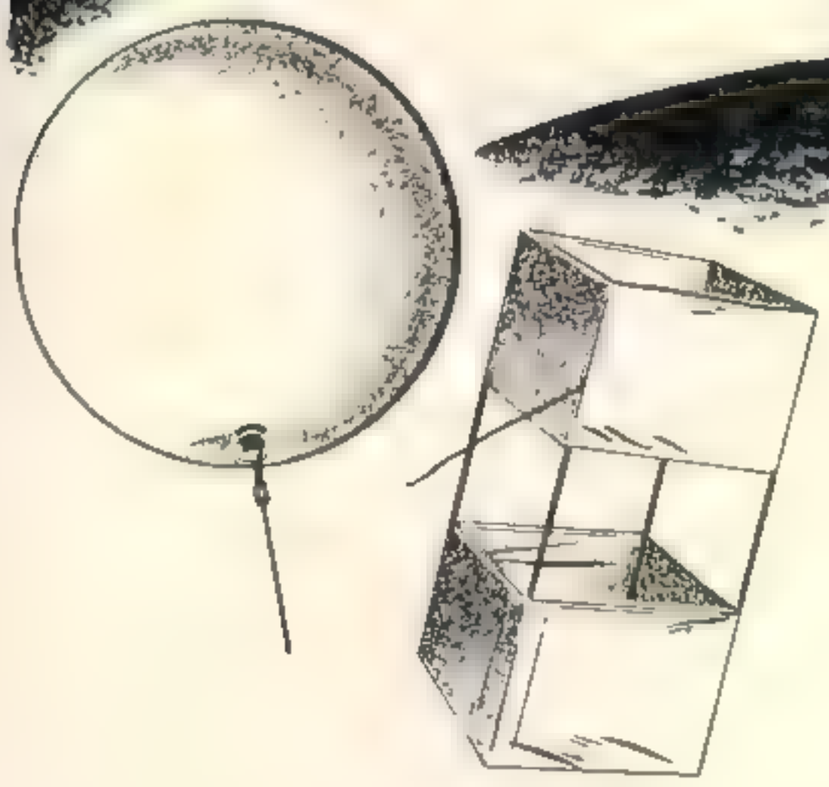
Lenore, W6NAZ, has notified us that, due to QRM, these changes have been made in the YL nets listed recently, and comments: "I feel like Old Mother Hubbard trying to keep track of the kids with these nets that change time and frequency so fast. Hope they'll be permanent this time."

NCS Edna, has changed her Thursday net to Tuesday at 8 p. m. PST, 7184 kc. NCS Miriam, W7JFB, has switched her Wednesday net to 8 p.m. PST, 3610 kc.

The popularity of the YLRL 10-meter phone net on Tuesdays prompts NCS Helene at W6MBD to now start the roll call at 10 a.m. PST, continuing to look for licensed YL ops till noon.

Licensed YLs not yet members of the YLRL are cordially invited to join in any of the nets to become acquainted.

Try These FOR BETTER PERFORMANCE

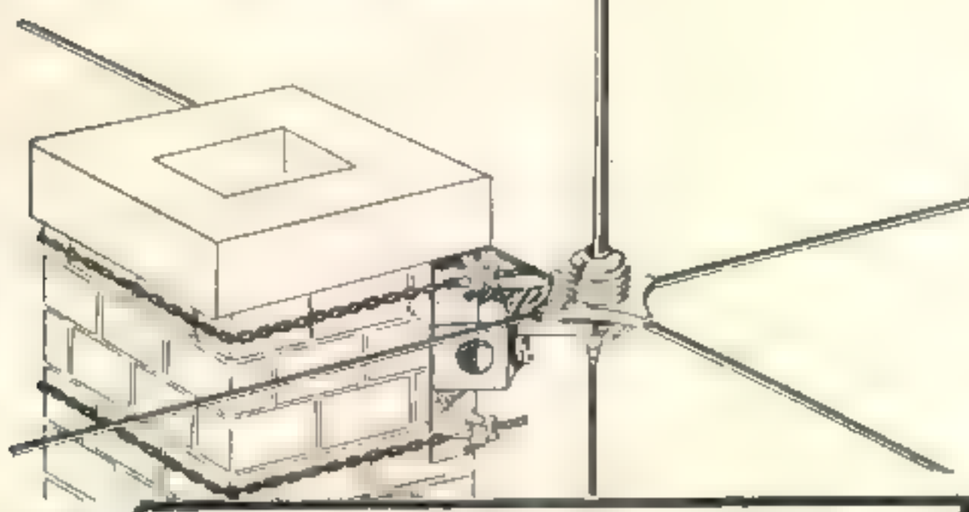


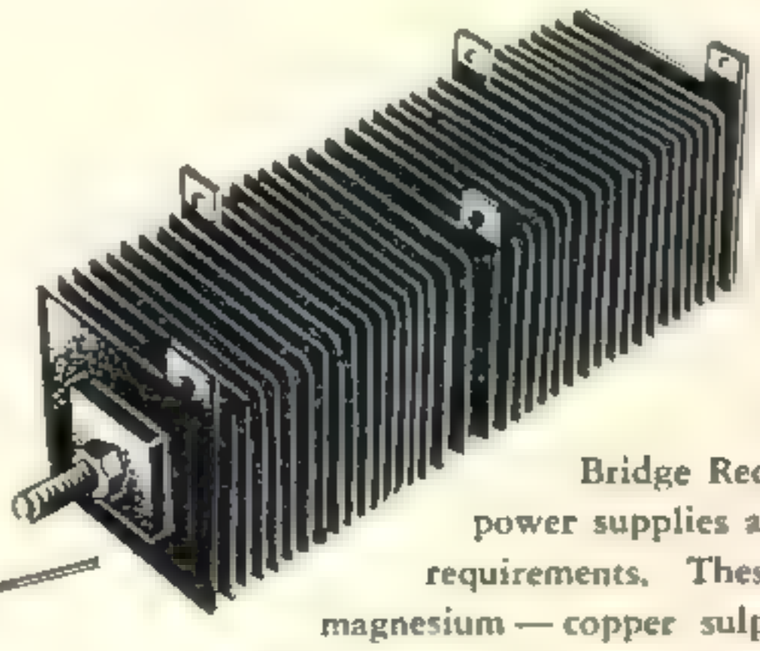
The advantages of real FM operation (less noise and QRM) can only be obtained with an FM receiver. You will be amazed at the difference in FM signals if you've heard them only on an AM receiver. The D & L FM Conversion Unit (not a kit) can be quickly wired into any receiver having an I.F. frequency between 425 and 475 KC. Price only $15.45 complete with instructions.

Super DX is possible with a long wire vertical antenna supported by a balloon or kite. Low angle of radiation and easy to load. A complete kit consisting of 2 heavy duty 4 foot balloons, 2 hydrogen generators, a folding aluminum frame box kite with water repellent cloth sails, and 300 feet of stranded antenna wire, packed in a tubular canvas carrying bag, is priced at only $9.95. (Originally cost about $75.00)

Standard Make Type 826 — 60 Watt UHF Transmitting Tubes at 49c each! The growing popularity of the higher frequency bands makes this general purpose tube an outstanding value. These 826's are brand new, inspected, and in their original cartons. Shipped only in boxes of 8 tubes at $3.92. (Add 50c for mailing anywhere in U.S.) Ceramic Tube Sockets for 826, 829B — 50c each.

Ground Plane Antenna for 2, 6, or 10 Meters. Clamps to any vertical or horizontal support and is fed with RG8U coaxial cable directly through a connector at the base. Made to withstand extreme weather conditions. Ideal for operation at very high frequencies. Price, complete with ceramic insulated mounting, copper-plated steel elements, heavy duty chain clamp, only $12.50. Specify frequency.





Standard Make Full Wave Bridge Rectifiers for battery chargers, power supplies and other low voltage D.C. requirements. These are the high efficiency magnesium — copper sulphide type rectifiers which are known for their long life at high output. A.C. Input — 32 volts at 9.5 amperes. D.C. Output — 14.8 volts at 7.3 amperes. Price only $4.85 each.

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DX

(*from page 50*)

issues its own coins and stamps. Claims for Pakistan contacts will, of course, be honored from the date it received its independence. If any of you fellows have received notice, prior to this announcement, that we have deleted Pakistan from your claim, you should submit it now for credit.

CE3AG, secretary of the Radio Club of Chile, tells us that the Chilean administration has just issued licenses to two amateur stations located in the Chilean Antarctic area. These stations, *CE7ZA* and *CE7ZB*, will be in Graham Land and will operate both phone and c.w. on amateur frequencies. Since they will be running about 500 watts input, you fellows shouldn't have any trouble hearing them. Further along this line, any other stations whose calls begin with CE7Z- will be in this same Antarctic area. All QSL cards to those stations should be addressed to the Radio Club of Chile, P. O. box 761, Santiago, Chile. CE3AG says not to expect your card from them much before the end of 1948, obviously, due to the infrequent mails from that territory. Graham Land is under consideration as a new country, but nothing official as yet.

W1ZL took time out to drop me a note while commuting on the N.Y.-N.H. & H. rattler, the letter ending abruptly when he arrived at the Grand Central station. Anyway, W1ZL says he has been too lazy to make a Zone and Country list, but he actually has worked 126 countries. I suppose it will require a longer train ride for him to cook up these lists. Carl says his antenna is a laugh, consisting of a 14-mc. half wave beginning at 7′ off the ground with his antenna tank, and running at an angle to the roof peak, which is 20′ high. W1ZL says he doesn't know how it works, but he got a bang out of working a 2½ hour W.A.C., the other day. He is running 200 watts into a pair of 811s, while the receiver is a 1937 HRO.

W6PXH, who is a dyed-in-the-wool phone man and going slightly nuts over DX, broke the monotony, the other day, when he worked *VK6HL* in the middle of the afternoon, the *long way around*.

A lot of the boys are working *W3LYK/Antartica*, and W2FRX says he is located on Stonington Island, Margarita Bay, South Polar Cap. He told W2FRX he would be back at his Washington, D. C., QTH in June of this year. From my local Operative No. 1492, the picture on the guy signing *USØKGA* is now clarified. It seems that some of the boys were working him, signing this call, and were under the impression that he was on Wrangell Island. However, RAEM told W6VFR, I think it was, that he was located at Cape Shmidt (not sure of spelling) on the mainland, across from Wrangell Island. RAEM also said UA is the correct prefix, and, apparently, this is true, because the fellow is now signing UAØKGA. Yep, it's Zone 19. Also, from this same operative No. 1492, I learned that FQ3AT is now operating in French Cameroons, and, so, of course, he is signing *FQ3AT/FE*. His QTH is Ivan Pastre, Base Aviation, Douala, French Cameroons.

VE3AEL says he only gets on the air for a couple of hours every day (wish I could say as much), but he seems to work his share of DX. The rig winds up with a pair of T55s with 500 watts input; the receiver being a 1155R which he converted. VE3AEL operates phone, both 10 and 20, and one of his most interesting QSOs was with *LA2UA*, who was airborne and flying at about 8,500′, in the vicinity of

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new HALLICRAFTERS model S-53

The world's at your fingertips with the exciting new Hallicrafters S-53 receiver. Five bands pull in everything on the air that you want from 1630 kc standard broadcast to 6 meters. It's a beautiful new receiver in styled steel finished in satin black with chrome trim . . . a smart addition for a engineered ham shack.

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Five bands: (540-1630 kc) (2.5–6.3 mc) (6.3–16 mc) (14–31 mc) (48–54.5, 6 meters). Latest series type noise limiter circuit. Built-in PM dynamic speaker. Uses three tubes: 6C4 Oscillator, 6BA6 Mixer, 6BA6 first I.F. Amplifier, 6BA6 2nd IF Amplifier, 6H6 Detector, A.V.C., A.N.L., 6SC7 BFO and 1st Audio, 6K6GT audio Output, 5Y3 Rectifier, operates from 105–125 volts, 50–60 cycles, AC (The S-53-U operates from 110, 130, 150, 220 or 250 volts 25–60 cycles AC).

Iron core IF transformers, slide-rule illuminated dial, separate bandspread control, fine tuning scale, two Phone Jacks, one for phono

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Employs 2 mc. IF for improved image ratio, and positively eliminates all amateur station images or repeat points within the amateur bands.

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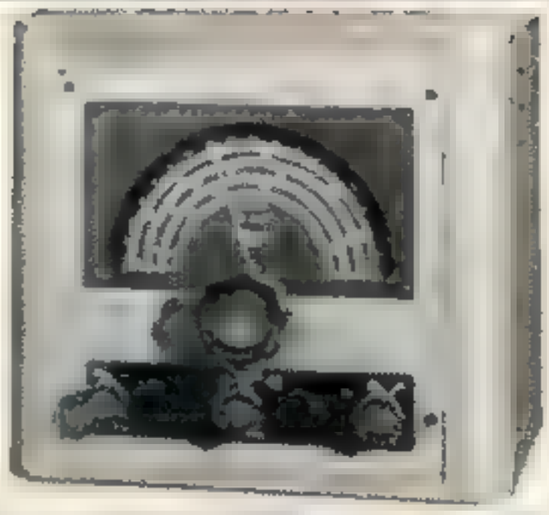

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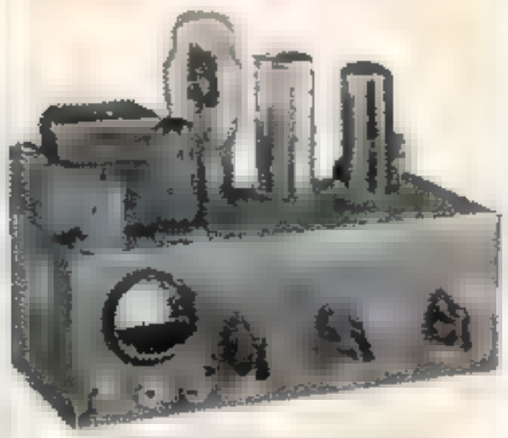
Newly designed self-contained modulation meter. Unique design and precision engineering insure the highest accuracy. Direct reading dial. Meter compares developed modulation voltage with voltage required to 100% modulate an RF amplifier. Will operate with all-plate modulated transmitters. Dimensions are 4½x5⅝x4½". C21477- **$19.95**



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Rome, Italy. This particular QSO lasted for about 1½ hours. Incidentally, it seems that LA2UA now operates from Norway on 28,162, and is on at approximately 9:30 a.m. EST.

It is good to hear W9PK back chasing DX on 20. As some of you know, he has been doing some v-h-f work since the war ended. Jack is running 500 watts into a pair of VT127As, the antenna setup consists of a 488′ long wire plus two half waves in phase for Europe.

The Radio Club of Peru recently celebrated its 17th anniversary, and, for the first time, it admitted YLs to the affair. Possibly responsible for this was the ham spirit shown by *OA4D*, who is the first Peruvian YL operator. A silver trophy was presented to *OA4E* for his record making contact with W4IUJ, which was done on 50 mc. Of course, this stuff should be reported in Vince Dawson's column, but we have to slip once in a while. To go on with the story, a bronze plaque was awarded to *OA4M* for the high score on phone in last year's DX contest.

W3JTC was told by Marie, *ZS6KK*, that *ZS6OL* is now *VQ4AWH* and is active. W3JTC also says that *EP1AL* is now apparently sending cards, because he has received his, but that mail has been returned on *EP2DS* and *ZD2G*. Notations on the envelopes addressed to ZD2G went something like this, "Try Southern Rhodesia and Natal, Union of South Africa." W6AX dragged his modulator out of moth balls after spending a year on c.w. and this is what he has worked on phone: 2 zones, 2 continents, 2 countries, and 2 states. Too, bad!

CE7AA, that old time DX man located way down on the southern tip of Chile, is again active. He is running about 400 watts input and operates on 14,006 and 28,012. He has a four-element beam under construction for 14 and 28 mc., and by the time you read this, you should be able to get a pretty good idea of kind of a signal this beam tosses out.

W6ZZ, being statistically inclined, relates that he had 797 DX QSOs during 1947, and 935 W and VE contacts. This makes a total of 1,732 QSOs. I'll bet W2IOP couldn't match this.

W9VW was asked by *MI6ZJ* to pass along the information that the official prefixes for British personnel in Eritrea are MI for civilians and MD3 for service personnel. Therefore, from now on, it will be *MI6ZJ* and *MI6JB*.

G4QC has been on 7 mc. exclusively for twelve months and has worked over 350 Ws. At the time of writing me, he was needing contacts with W6s and W7s. Some of you fellows might give a listen for G4QC around 7042 kc.

W6EPZ has now settled back into an easy chair waiting for Zone 23 to pop up. His attitude is a little pessimistic when he says that he won't stand much of a chance in the dog fight, the next time Zone 23 is heard on the West Coast. He'll probably work him first!

YV5AB operates on 20-meter phone and has worked 32Z and 110C, but, as yet, I guess he hasn't been able to borrow a stenographer to type his list.

W6ENV, who will probably gnash his teeth if I say he is still waiting for his C8YR card, heard but didn't work a new one, *VQ4HGB*. Normally, maybe this wouldn't amount to much, but he is ex-AC3SS, who, as most of you will remember, operated in Sikkim just outside of Zone 23. At the time Andy heard him VQ4HGB had been on only three days. His full QTH is: VQ4HGB, Henry G. Baker, Barclays Bank, Nairobi, Kenya, East Africa.

CE3AG finally nailed his 40th zone on December 16, it being *VQ8AY*. While we are waiting for all of his cards, he will show up in the Honor Roll with

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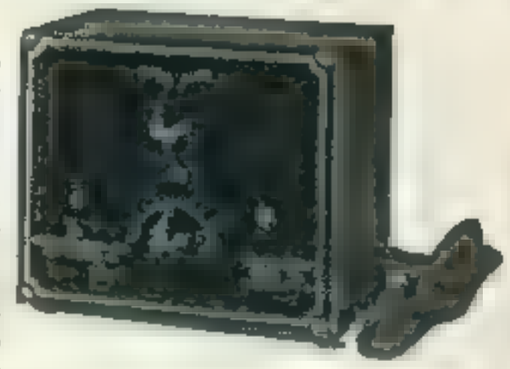

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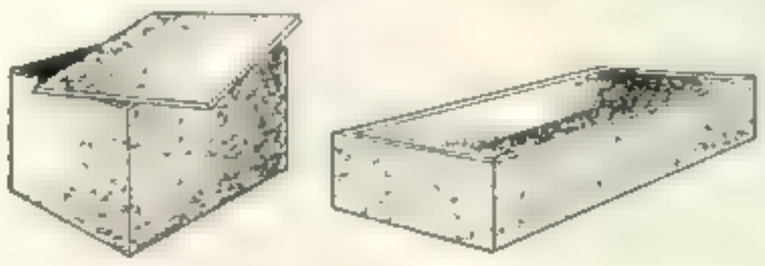

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1¾″	$.56	8¾″	$1.03	15¾″	$1.91
3½″	.61	10½″	1.26	17½″	2.15
5¼″	.79	12¼″	1.50	19¼″	2.27
7″	.88	14″	1.71	21″	2.53

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A fine all purpose chassis made from one piece of No. 20 gauge steel spot welded at all four corners. Bottom edges are folded over on four sides for additional rigidity and drilled to match bottom plates. Bottom plates are drilled to match holes on flange of chassis and have pressed bumpers at corners. Material No. 20 gauge steel.

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5x10x3″	.73	7x17x3″	1.06	11x17x3	1.59
4x17x3″	.88	8x17x2″	1.15	12x17x2	1.32
6x14x3″	.85	8x17x3″	1.21	12x17x3	1.44
7x7x2″	.62	10x12x3″	1.15	12x17x4	1.56
7x9x2″	.73	10x14x3″	1.21	13x17x2	1.76
7x11x2″	.79	10x17x2″	1.21	13x17x3	1.97
7x13x2″	.85	10x17x3″	1.29	13x17x4	2.27

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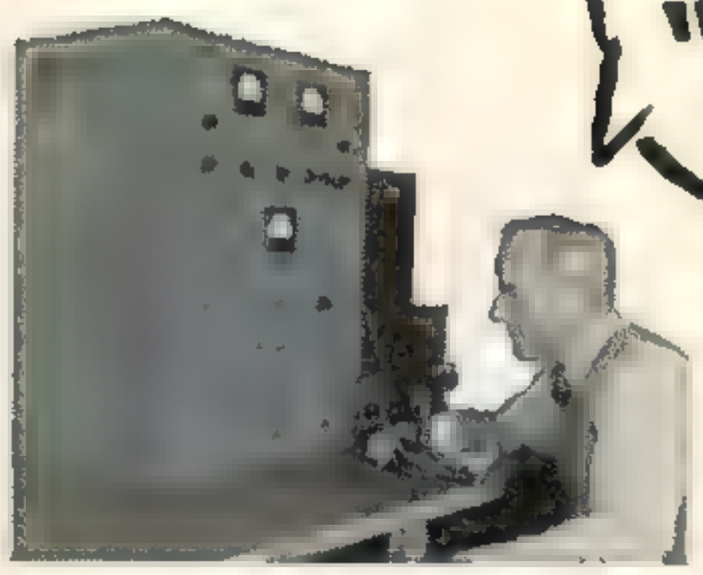

Harry Rex, Jr.-W1QLL says . . . "It's a swell looking rig, well engineered and the wiring is something to be complimented." Harry is one of many satisfied users. Write to Leo for the names of users in your locality.

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Above less tubes, meters, coils, and cabinet.

3 section cabinet for complete kit, with antenna feed insulators installed. Size 28 3/16" high, 22" wide, 14 3/4" deep Weight 38 lbs $19.50

Tubes for Modulator.	$8.80	Tubes for RF Final	$13.90
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Tubes for RF Exciter.	6.80	Coil set for RF Final, per band..	4.00
Meter for RF Exciter.	5.50	Tubes for Power Supply	4.50
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Complete with tubes, meters, cabinet, set of coils.

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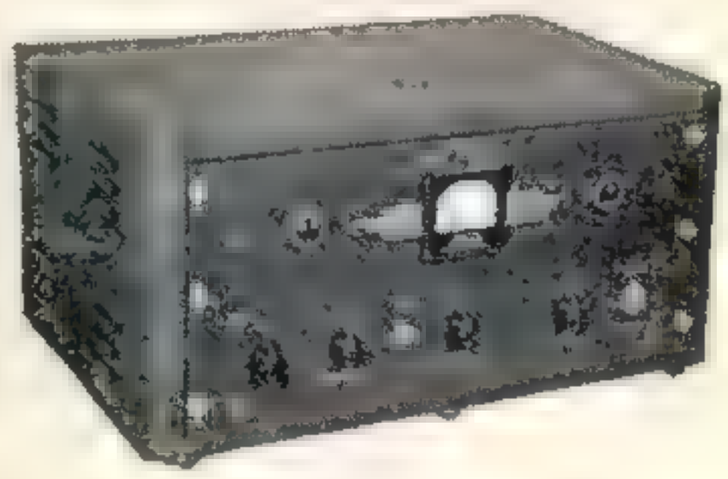

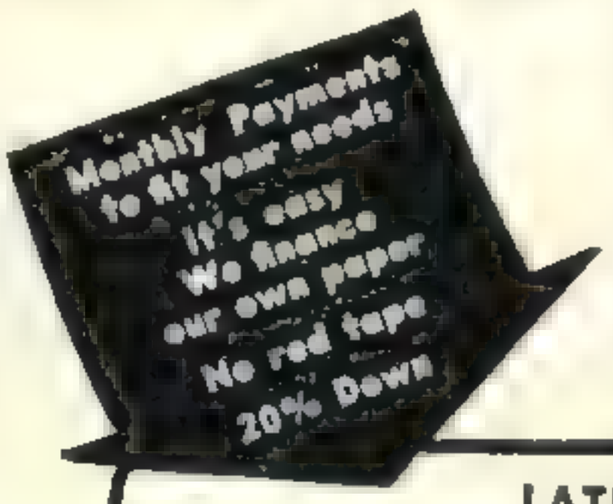

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39Z and 132C. Will this be the first SA W.A.Z.?

Do You Have a Doubtful Country?

If any of you work a station in a country, and you think it should be a different country than those shown on the Official Country List, please don't send it in to us to be added to your totals. Only those countries shown on the Official Country List and those subsequently added, which have been announced in *CQ* and *QST* simultaneously, will be considered by the DX committee. You're the best gang of guys in the world, and I don't blame you for wanting to take advantage of each possible new country, but until new countries are announced in the DX column, we are not allowing credit for them. Take this case for instance: Suppose you work a MD5, which is a prefix assigned by the local British army authorities in the Suez Canal Zone. Since this is not recognized as a separate country from Egypt, it obviously gums up the detail work of our DX committee when it is submitted as such. It means that during one of the late sessions of this committee, one of us has to take the time to drop you a card advising of the change in your country totals. There are several other calls submitted every month by quite a number of you fellows with the hope that they might be counted as a country. Why not do this. Don't put in a claim for one of these uncertain countries unless it appears on the Official Country List, or until it has been announced as a new country, in this column. However, if you want to voice your opinions on a possible new country that might pop up from time to time, we will welcome a letter from you on this. So, what do you say, let's not make any claims for countries unless they are shown on the List or have been announced. Thanks, fellows.

W6VFR still seems to find enough new ones to keep on top. His latest are *WØOZW/KS6* on American Samoa and *MD7DA* on Cyprus. This gives Marv 184C, and, of course, W.A.Z. Close on his heels is W8HGW with 183C; his latest are *VQ1HJP* and *W3LYK/Antarctica*. W8VLK says he has been looking for his call in the Honor Roll for a couple of months, and he'll find it there now with 37Z and 92C. Incidentally, *EA1A* told him not to try to QSL, due to his present location, and, likewise, he was not in a position to QSL either. W8VLK uses a pair of 813s and a two-element rotary on 14 mc.

A new one we are glad to see in the phone section of the Honor Roll is W8QBF with 33Z and 79C. By the way, take it easy if you are going through Olmstead Falls, Ohio, as W8QBF happens to be the Chief of Police there.

It looks as though W6DI is still on top of the phone section of the Honor Roll with 38Z and 135C. His new ones are *ZD3B*, *ZS3D*, and *EA7BA*. Oh, yes, let's not forget Guy's key punching activities . . . 39 zones and 158 countries. W1HKK is really up there, too, with 37Z and 131C. His latest include *HA4AB*, *ZD3B*, *W2FH/VR4*, and *EA8EDC*.

Let me take time out to remind you fellows again that if you are in the 1948 DX Marathon, and I hope you are, you'll need to get your stuff in the mail within sixty days of the date of the QSO, otherwise, it won't count. This eliminates the possibility of any of the fellows, who would like to be a dark horse and lay back in the woods with some juicy totals, mailing in their totals during the last part of the year. We want to keep the published totals in the Marathon on a current basis.

W1MCW has added a bunch of countries to her already imposing phone totals, now making 35Z and 116C. WØYXO put up a three-element wide-spaced rotary and has really been going to town.

WILCOX CW 3
7 Tube Receiver **$12.95**

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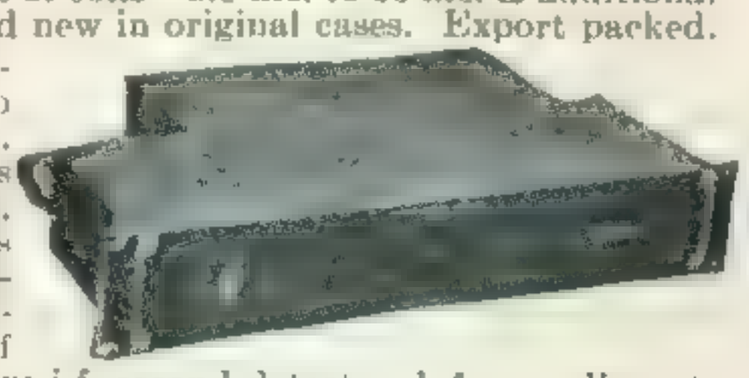

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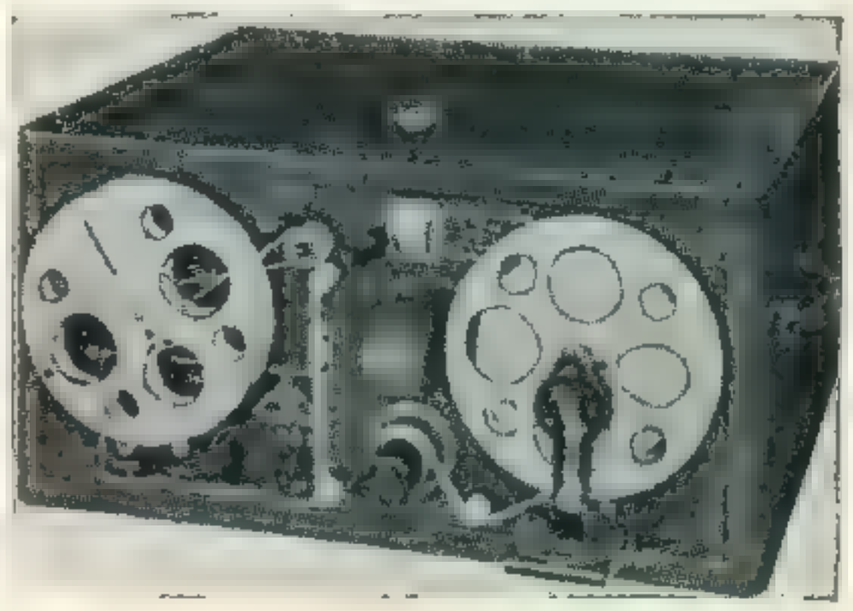

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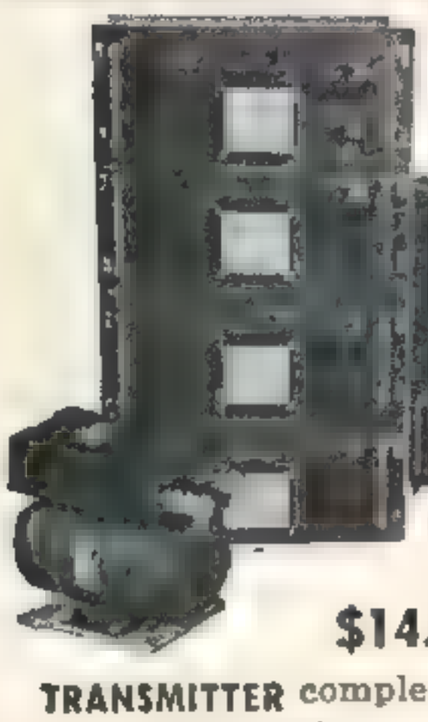

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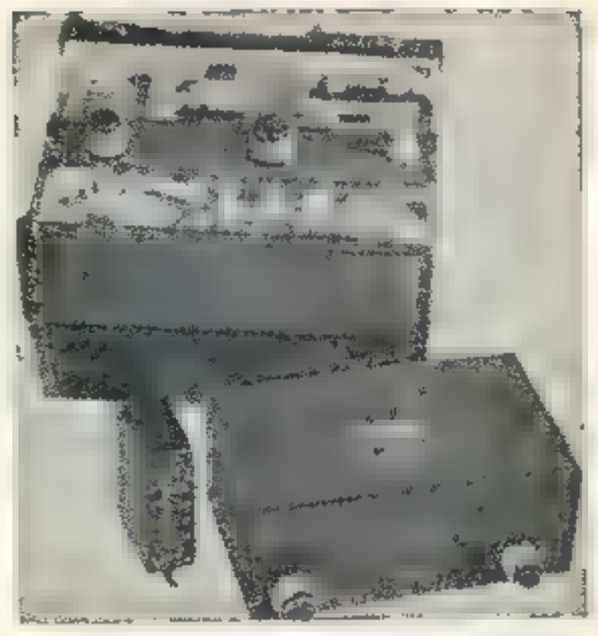

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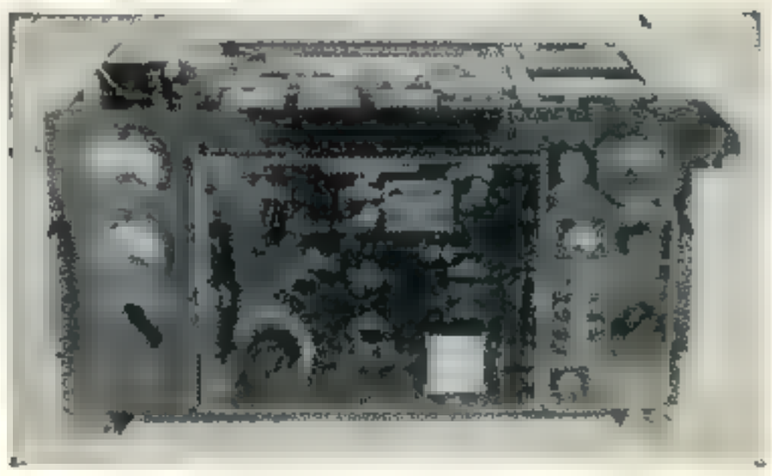

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He is now up to 164C with zones at 39. He says that never before has he been able to work Europe, the Mediterranean area, and India the long way around, as he has done with this new beam. Now, along comes WØGKS who has added a few, making 144C. Doc wants to know what we know about *YI1DD*. It seems as though he is YI2AM . . . if that helps. Another one of the "Zero" quartet, WØNTA says that since WØYXO put up his new beam, "You can have him, I don't want him, he's too fast for me!" He says Ken is knocking off stuff that he can't even hear. I don't know what happened to the other member of this quartet, WØNUC. Something slipped somewhere, because we haven't heard from him this month. I get quite a bang out of the competition of this Zero quartet. They all *appear* to get along well with each other, but, on the other hand, who knows, when they get together, they may pitch a few daggers. Seriously, it is too bad there isn't more of this fair and honest competition.

KG6AL is a new one to the Honor Roll with 39Z and 102C. The last zones for him to grab were 40, 19, and 2. Of course, it is interesting to me that someone else had trouble in getting Zone 2. Incidentally, how *does* one work Zone 2? Guess getting on the air would help some. See where my mind wanders? Getting back to KG6AL, he said he was leaving Guam shortly after writing this letter, so probably by the time you read this, he will be back in the States. He says anyone with whom he hasn't exchanged cards, and who would like a KG6 card, may be certain of getting one if you will send yours to his home address: 1333 Boyd Street, Des Moines, Iowa. His future plans for hamming are uncertain, but he believes he will take a crack at 6 meters.

W9MZP says his DX was slowed down somewhat with the arrival of a new Jr. Op.; then the holidays, as well as rebuilding the rig, contributed to his inactivity. I rather imagine, though, W9MZP will be doing a little more early morning DX than he has in the past. Jr. Ops have a knack of getting you out early . . . maybe not for DX . . . but George will have to figure this out.

W6AM got off to a late start last year, but now he is up to 39Z and 134C; latest one being *ZD4AM*. W6LRU is looking ahead for a big 1948. His XYL gave him a three-element beam for Christmas, and along about March, he is moving up on one of the hills, Point Loma, which overlooks San Diego bay, and practically everything else for that matter. A few of the boys heard a station signing *AC3GG*, but we don't know a darn thing about him.

W4ESP has his 807s working overtime and reports that WØLHS and W6PVB have the Gatti-Hallicrafter Expedition on the air. Their QTH is Gatti-Hallicrafters Expedition, c/o Private Bay, Nairobi, Kenya Colony, British East Africa. In Kenya they will sign VQ4EHG, in Uganda VQ5HEG, and in Tanganyika VQ3HGE. At present operation is confined to 28 mc. with a vertical half-wave doublet, but a rhombic on the states, Chicago in the 9th Call area to be exact, is under construction.

If you want to send a card to *ex-VU2PB*, formerly on Andaman Island, you can use this QTH: (This is what XZ2HP told W6PFD) D. C. Dove, Millhouse, Scoulton, Norwich, Norfolk, England.

Well, gang, that just about winds things up for this session. I am ashamed of the activities at W6QD, for the past month, but, who knows, I may read another chapter in "CQ DX" and then make a fresh start. Oh, by the way, if any of you W9s read this stuff, you, too, are entitled to enter the 1948 DX Marathon. I guess I better QSY before I get piled on. 73.

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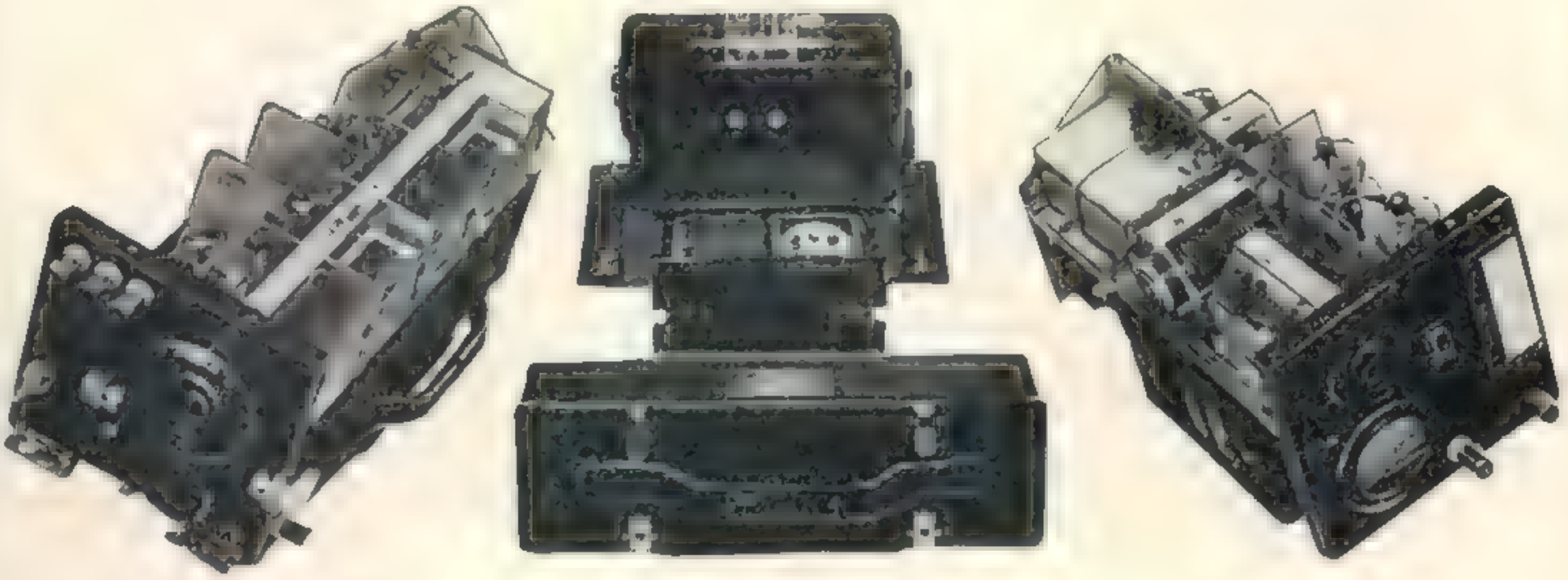

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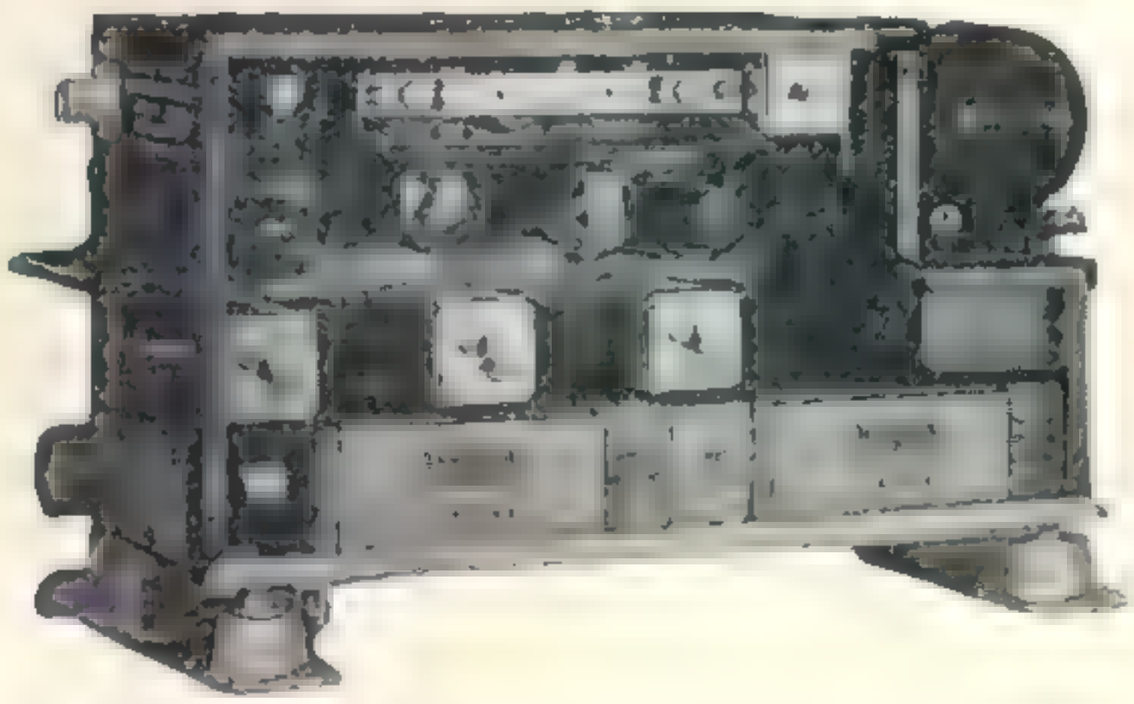

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(*from page 54*)

while G6DH's goes even further with around 700. All of these, of course, are not just stations worked, but include harmonics heard above 45 mc., along with the contacts made on 50-54 mc. These reports are important for any analysis of 50 mc. propagation, so thanks fellows for the co-operation and keep 'em coming. Don't forget a dead day is just as important to prognasticate!!

6 meters and 2 meters have really stepped out in '47. Quite a few of the fellows have remarked that it is time all the v-h-f gang got together, at a centrally located spot, for the biggest hamfest in v-h-f history.

Of course the success of an affair like this would depend on how many of you supporters of the spectrum could make it. So how about some comments from readers on where it should be held and when. G5BY has indicated he could be there. So have some of the VEs and possibly others outside our borders. Don't forget that whatever city it is held in, there will be quite a responsibility for someone to get the hotel space, plan the program, etc.

Now let's take a look at the openings that have occurred since Dec. 21.

6-Meter Openings

Dec. 21st: W3OR worked, from 1255–1317 EST: W7FFE, CTY, HEA, ERA and heard W7FID, WONFM, with excellent conditions. W4EID made it with W7BQX and W7ERA between 1336–1400 EST. W5JLY had a "quickie" with WOZJB (Es) at 2152 CST. W7ERA hooked: W2BQK, W3OR and W4EID from 1300–1355 EST, and heard W2AMJ, RLV, IDZ, W3CGE, W3RE, W8TQB, the latter unusual for trans-continental work. W7HEA eeked out QSOs with W3OR and W8TOB from 1310–1317 EST. W7BQX at 1300 EST worked W3OR, W2AMJ and W4EID, very poor conditions. Weak signals were heard until 1730 EST, but unreadable.

Dec. 23rd: On Es W4EID got WOCHI at 1900 EST. W4WMI/4 in Georgetown, Ky., hooked from 1910-2014 EST; WOZJY and WOUNQ in Wichita, Kans., W5HF, LIV, WX, with good conditions. W8ZVY got WOZJB at 1925 EST, fair conditions. W8QYD worked; W5WX, W5HF, from 2057–2216 EST. W5WX made it with: W4WMI/4, W8ZVY, W9ZHB, W8QYD and heard W9FHR from 1920–2040 CST. W2RLV, W2RLV in W. N. Y., had a lone QSO with W4GJO at 2020 EST.

Dec. 24th: W5JLY worked W7QLZ at 2045 CST, only signal that was coming in. W7QLZ also heard W5FRD around the same time. W8QYD got WOBDQ at 2047 EST.

Dec. 25th: W7BQX's Xmas present was a QSO with W2AMJ, very weak, at 1510 EST.

Dec. 27th: This date marked the first double hop Es ever reported during the winter. W7QLZ worked: W4EID, W5ZG, W5JLY, W5ZZF and heard W5LIU, W5AJG, W5LIV, W9CBJ/4, W4EQM, W4QN, W4FLH. W2RLV got: W4GJO, W4EQM, W4FBH, W4LNG, W5JTI, from 2020–1837 EST. W4WMI/4, in Georgetown, Ky., hooked from 1510–1852 EST. W4IUJ, W4EID, W4JEP, W4QN, W4FBH, W4LQN, W5JTI, W5LIV, W5FSC with very good conditions. W4EID had 50 contacts in all districts except W6, from 1030–2215 EST, including VE3. W3OR made it with: W4EID, W4QN, W4GJO, W4EQM, W5JTI and heard W4IUJ, W5FSC from 1555–1855 EST, good conditions. W5ELL in N. Mexico heard weakly W5LIV at 2005. W5JLY worked west, getting: W6PUZ W6AOR, W6QFT, W6YRL, W7QLZ, between 2190-2233 CST. In Ill., W9ALU worked: W4EID, W4IUJ, W4FNR, W4FBH, W4QN, W4EQM, W5NLP (Miss.) from 1029–2005. To W5AJG it sounded like Es so he worked: W9ZHL, W4EQM, W5IUJ, W4EID, W9CBJ/4, W4QN, W4FLH, from 1950–2113 CST. W8QYD made it with: W4IUJ, W4FNR, W4QN, W4AVV, W4EQM, W5ZG, W9QCY, W9ZHL, from 1822-2121 EST. W4QN says the band was open from 1000-2300 EST when he worked W2-3-4-5-8-9-O.

Dec. 28th: W5JLY QSOd: W6PUZ, W6OB, W5JTI, W5ESZ from 1937–2020 CST. W4EID made it with WOZJB at 1105 EST. W5AJG got W4JEA at 0926 CST, fair conditions. W2RLV Es'd W4EIF and W4GJO from 2150–2219 EST. W7QLZ heard a WO at 1950 for a few seconds. W5ELL heard W6AMD around 1913 MST, S7.

Dec. 29: W3OR hooked from 2050–2145 EST: W4CDC, W5JTI and heard W4GJO. W4QN says the band was good to W1–2 and VE3 from 2000–2230 EST. W1ATP made it with W4EID, W4GJO and W4EQM, mentioning the W4s were working W2s and VE3s at the same time. Ferrell in Philadel-

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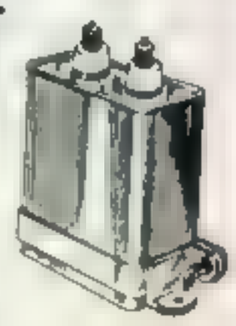

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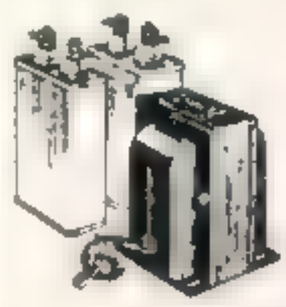

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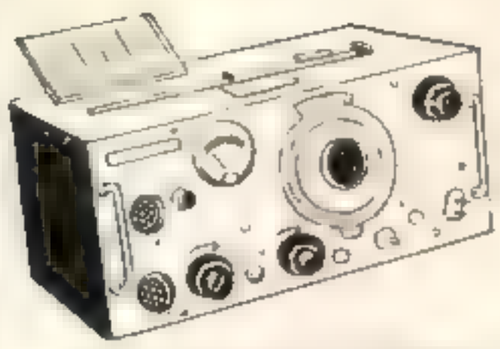

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No. 6029, 3–4 mc. No. 6031, 5 3–7 mc.
No. 6030, 4 5.3 mc. No. 6032, 7–9.1 mc

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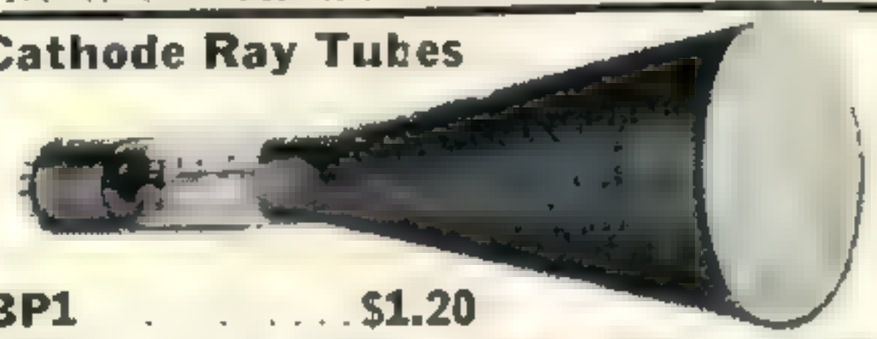

5BP1 ..... $1.20

3BP1	$1.25	3FP7	$1.20	5BP1	$1.20
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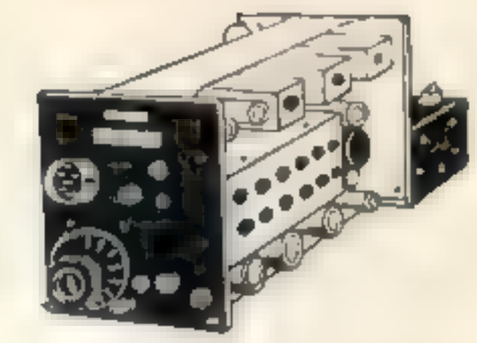

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Less Dynamotor, But W Fil xmfr **$19.00**

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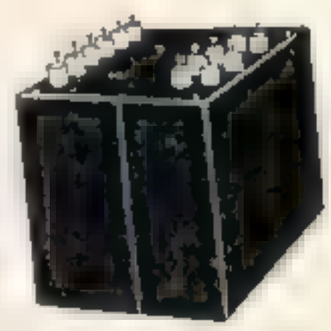

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PC 77, Input 12 VDC, Output 275 VDC @ 110 Ma. 500 VDC @ 50 Ma. **$3.25**
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DM 33: Input 28 VDC @ 7 a. Output. 540 VDC @ 250 Ma. Power supply for SCR 274 modulator..... **$3.95**
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MP 10 G Power supply, using 2 dynamotors. Input: 24 28 vdc. Output: 1000 vdc @ 400 ma, 230 vdc @ 100 ma. New, complete with relays, filters, etc. BENDIX **$20.00**

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phia heard: W4CDC, W4EQM, W5JTI, who were working W1-2-3, from 2129–2200 EST. W5JLY worked W8QYD and WOZJB, from 2040–2225 CST. W1NF got W4GJO at 2012 EST, and heard W4FBH, W4EQM, W4QN, W4GJO until 2145 EST. W8QYD had a W5 opening and hooked W5JLY, W5FRD, W5FSC, W5LIV and heard W4GJO very weak, from 2147–2325 EST.

Jan. 1: This brought the first 50-mc opening of 1948 for good trans-continental QSOs. W2BYM worked: W7BQX, W7ERA, W7EIO, W7FIV, W7EUI, VE7DU, VE7NM and heard W7BQX from 1503–1657 EST. W7CTY had nice QSOs with: W1RX, W1HMS, W1QUR, W1NWL, W1LLL, W1AEP, W1LSN, W1GJZ, W2LAL, W2MEU and VE1QY from 1525–1666 EST. VE1QY hooked W7FFE, W7BQX, W7DYD, W7CTY and W7HEA, all from 1630–1750 EST. W7BQX tore into: W1NWL, W1RX, W1QUR, W1EKT, W1COX, W2LAL, W2EUI, W2AMJ, W2MEU, W4HVT, W4JEA, VE1QY, VE1QZ, from 1504–1638 EST. W7ERA waltzed around with: W1LLL, W1RX, W1RO, W1DJ, W1HIL, W2BYM, W2HEL, W2LAL, W2RYT and heard VE1QZ, VE2LP, VE3BDY, from 1530–1435 EST. W7HEA Happy New Year'ed W1AEP, W1RX, W1IN and VE1QY between 1616–1656 EST.

Jan. 2nd: W2BYM worked W7DYD at 1553 EST and heard W7HEA. W7HEA made it with W1DJ and VE1QZ from 1537–1548 EST.

Jan. 4th: W2RLV hooked from 0952–0959: W4HVT, W4JBF and W5AJG at 0030 EST. W9ALU worked W3OR, W1HDQ W4HVT from 0958–1012 CST. Ferrell in Philadelphia heard from 1037 1131 EST: W9UNS, W9BHT, W9QUV, W9JMS, WOJVE, WOKYF, WONFM, WOINI, WOZJB and W4GMP, very good conditions. WOZJB got up late to get: W3RUE, W2BYM, W3OR, W4HVT, WOWOW/4, W8CMS, W8TDJ from 1015–1110 CST. W3OR worked: W8TOB, W9UNS, W9BHT, W9ALU, W4GMP, W4HVD, WOQIN, WOZJB and heard W4JBF, W9QUV, W9QAP, W8ZVY, WONFM from 0940 1208 EST. W8QYD made it with W3HC in Delaware for state 39. W5AJG had a normal Es opening working: W2AXN, W2RLV, W8CMS, W8WSE, VE3KE, VE3APF, VE3AZC, VE3AEZ from 1030–1132 CST.

Jan. 6th: G5BY reports the first winter Es opening to occur in Europe when he worked I1SS on 58.4 mc. at 1200 EST. He also heard another I1, and the 2nd harmonic of D4ASC in Munich, Germany, from 28 mc., and also the 3rd harmonic of several U. S. Forces Radio stations in Germany. No harmonics were heard in the 50–54 mc region.

Jan. 12th: W5COK got in on his first DX by working W6PUZ at 2130 CST. W5LIU made it from 2135–2154 with: W6ZRN, W6PUZ, W6AOR.

50-mc Notes

Harold Tucker, W8QYD, heard on Dec. 24-25 an m-c-w station on 49.5 mc. around 1600 EST, apparently coming from the N.W., no rebound was heard on 50 mc. though.

W4EQM in Langdale, Ala., says that he has had only one opening since last summer, and that on Jan. 4 Jim has spent all his spare time listening, and that's all.

Charley Rice, W8MVG, is glad the hectic month of November is over as he got a glass arm using c.w. and lost his voice calling so much. Time operating totaled up to 131 hours.

W5LIU, who operates W5FRD occasionally, the latter's station located in the Physics Lab at TCU, went to the shack on Dec. 31, only to find W5FRD had gone off with the key, so Herb, W5LIU, was locked out, not having either key or mike. On Nov. 23 W5LIU heard OX1LL calling OXU on 50.2 mc, mentioning he was going to take it up with the UN council unless more co-operation is had from Greenland! The 16-element stacked array at W5FRD came down in the New Year's storm, a sad sight to behold by any ham, says W5LIU.

W8QYD visited the Terre Haute gang on Jan. 2 and reports having a fine time.

Jack Woodruff, W9PK, left 6 meters for 40 and 20 meters to try this "DX" stuff. Jack is now more than ready to get back on 6, for he likes the fine fellowship and good sportsmanship displayed by the boys on the v-h-f bands.

W9FKI had just moved when the DX started coming in during November. A hurried set-up got him back on Nov. 2. His first DX contact with KL7DY. Ken was using a 135′ long wire as he had no chance to get the beam up.

Doc Farrar, W1CLS, in Waltham, Mass., is well

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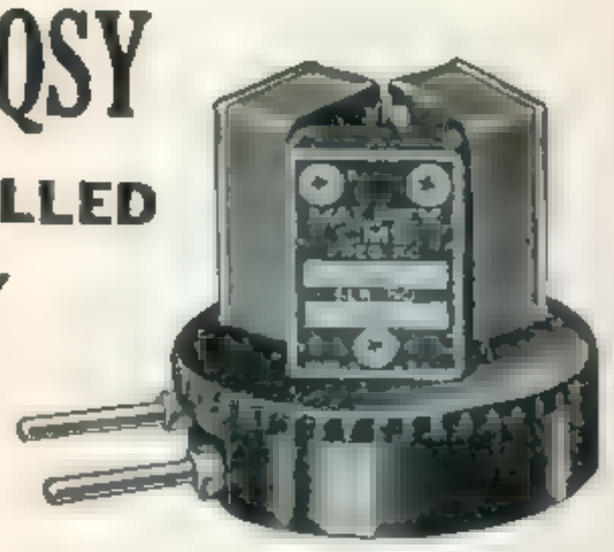

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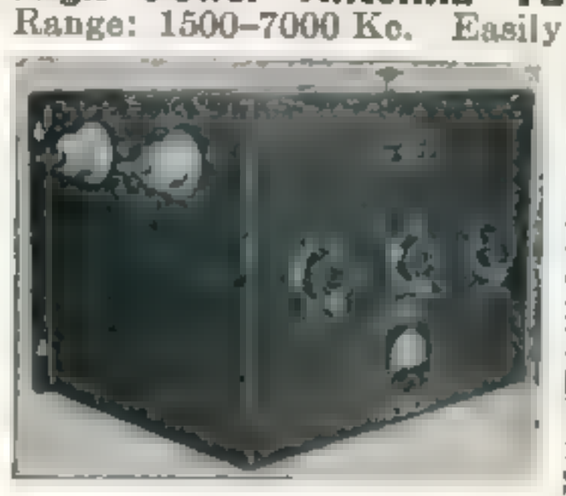

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known for his FB signal practically everywhere. Doc used an 8-element beam consisting of two 4-element beams, with the top stack 50′ off the ground. Checks on ground wave indicated above the expected 3 db gain, although he was frankly disappointed in not realizing more "operational gain" from the array on bending. The array has now been replaced with a single 4-element .2-wave spaced array, and the tower height extended to 68′, which seems to be a better arrangement. Doc's slogan for the New Year is "48 states in 48."

Bill Reilly, W2RLV, wants to know why we list in the Honor Roll the different call districts in England. Well Bill, if we show more in the way of DX listing it might make some more of the fellows interested and want to try it.

Activity has picked up in Utah according to W7SP, in Saltair. The Salt Lake City gang now includes W7JPN, W7QQD, W7EWX, W7JPS, W7KMR and W7SP. In Ogden, W7DLR and W7UPI are on 144 mc and expect to be on 6 meters in time for the summer's DX. The only opening came in November, when W7SP worked VE1QZ, but the gang is still in there pitching.

W5JLY, in San Antonio, still believes his contact with G5BY on Nov. 16 is the first G5-W5 contact. Well Earl, we agree also, unless there are some holdouts that have not reported their contacts to us.

Larry Mueller, W8RLT, says the DX started off on Oct. 26, when he heard G5BY on *58.6 mc*, but the signal faded out before contact was made. Larry did get Hilton, G5BY on, the 27, crossband 28-50 mc at 0845 EST. Since then W8RLT has added KL7DY, W5BSY/MM in the Azores, PAØUN and some of the scattered sigs.

After spending two days calling and looking for W7ACS/KH6, W5ELL heard him answer his CQ on Dec. 14. Naturally Ed answered, but later found out that W7ACS/KH6 did not hear him come back. Ed, W5ELL, says the MUF on Jan. 1 went to 42.5 mc, but nothing on 6 meters.

A new addition to the Raleigh, N. C., gang is W4JEA at Wake Forest. John is in school at N. C. State and doesn't have the time he wants to put in on the band. W4JEA did work some Es and F2 trans-con, and now has 10 states. The rig is a pair of 24Gs, and a 3-tube converter using 6AK5-6AK5-9002, ahead of an S-20R.

W2AMJ, Frank (Converter) Lester, says that the East Coast boys have mulled over the National v-h-f convention and think it would be a swell affair. Frank suggests we might hold it in conjunction with the National Radio Parts Show, which is held every May in Chicago. This is a good idea as then everyone attending could see what the Manufacturers have to offer for "49" in the way of radio equipment.

The Ft. Worth gang now have a net on 6 meters each night at 2030 CST to encourage local activity and possible contacts with other Texas lads outside of town. W5COK is a recent addition, and worked a W6 on Jan. 12, the first night he was on.

Remember WØVWU, Topeka, Kans.? Well he is now living near Albuquerque, N. Mexico, and has joined up with W5ELL and W5LFH. Although a 10,000′ mountain is between WØVWU/5 and the others he gets S9 using an inside doublet antenna, with 100 watts to an 629B. W5FLH is rebuilding to 400 watts for 6 meters.

W7DYD, who has been in on plenty of the transcontinental openings, says a good 6-meter opening leaves all the local gang exhausted. Bill's location is down in the valley, and auto QRM is always worse during an opening. WØKQO still has to crank up the light plant to get QSOs with us guys. Arnold

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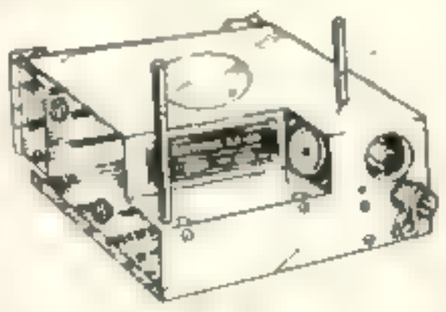
Converts BC-312 receiver to AC operation. Fits in dynamotor compartment. Also for external use with BC-348, 311, 224, and used with BC-696 & 459 as ECO. Input 110-120 VAC 60 Cycles. Output 250 VDC @ 95 Ma, 12V @ .6A, 12V CT @ 3A. Shipping weight 12 lbs..... **$7.95**



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Type No.	Amateur Net Price	Sec. Rms. Volts	Sec. DC Volts	DC Sec. M.A.
P-3157	$ 5.55	(660–660) (550–550)	(500) (400)	250
P-3158	7.20	(1080–1080) (500–500)	(1000) (400)	125 150
P-3159	6.00	(900–900) (800–800)	(750) (600)	225
P-3167	17.85	(1450–1450) (1175–1175)	(1200) (1000)	300

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says the local boys have been rolling in, and a few openings to the south have made it more interesting. NBFM is planned for this summer to lighten the load on the power plant.

Charley Rice, W8MVG, now has his rig fixed so that by the flip of a switch he is on 6 or 10 meters. If he misses an opening now, he says it will be because both of his arms are broken.

In Metamora, Ill., we find W9ALU busily trying to thaw out his pen, to write us a letter. The temperature was 10 degrees, and you can't write with a piece of ice. Hod has one of the 7–9 mc. v.f.o.s which he will have on soon. It works fine too, we are using one on six.

144-mc Notes

While in QSO one night on 26 mc with WØRNC of St. Joseph, Mo., we asked him to shift to 2 meters to see if the new VHF-152A we had was perking there. Using our 6-meter beam on the VHF-152A we were amazed to pick up WØRNC a good S4, the distance being 50 miles. WØRNC uses 100 watts to an 829B, a 522 as the exciter, feeding a 6-element stacked beam consisting of two 3-element beams stacked ½-wave above the other. The receiver at Jim's is a VHF-152A into an SX-25. He has worked WØDDX and WØMZH in Kansas City numerous times, a distance 65 miles. Some nights the signals are S9, while at times they have been down to S2.

W5JLY, in San Antonio, Texas, has had a 522 on 145.6 mc for the last six months, with nothing heard to date. A 16-element beam is planned, in the meantime he is looking for W5VV in Austin about 100 miles away.

W1PIV in East Freetown, Mass., sends us his 2-meter Honor Roll Score and we find he has 11 states and VE1. The districts he has worked are W1-2-3-4. The rig at W1PIV is 300 watts to a pair of 4-65s, v.f.o., and the antenna is two 5-element beams, one vertical, the other horizontal. A 32-element horizontal array is in process of construction. Sounds as if Ed, W1PIV, is really going out after the horizontal gang around Chicago.

W1IZY also of East Freetown, Mass., has 12 states and VE1, having worked Delaware that W1PIV missed. The rig is 200 watts and a 5-element vertical beam. More of the gang around Boston are getting interested in horizontal beams it seems. This summer should produce some nice hauls, and that Chicago-East Coast jump doesn't seem far off.

The co-holder of the 2-meter DX record, WØWGZ of Grinnell, Ia., has 4 states, 4 districts and 13 stations worked, something of a record, coming from remote parts. Arnold was home during the holidays and worked his first stations to the west of him, about 50-80 miles. All these stations are around Ames, Ia., and include WØTIO, WØTIQ/Ø, WØCHI, WØHVF, WØAEH and WØCYL. All are crystal controlled, using 522s and 4-element horizontal beams. Not bad activity and lots of fun for them. Now how about skeds with WØRNC and WØZJB?

Seems like activity in WØ is really picking up

144 MC Honor Roll

W1IZY	12	4	VE1	W3RUE	5	3	VE3
W1IPV	11	4	VE1	WØWGZ	4	4	
W9ZHB	9	6		WØDDX	2	1	
W9LWE	8	5		WØMZH	2	1	
W9IPO	8	5		WØRNC	2	1	
W9BBU	8	5		WØZJB	2	1	
W8QKI	7	4	VE3				

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B.C. 455A.
6-9.1MC **$5.95**

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B.C. 459 7-9.1MC (VFO) ..... New **7.95**

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Band pass filter FL8 ..... **1.95**

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4000 U-2 Mfd **4.95**
5000 V-2 Mfd **6.95**

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872 ..... **$1.59**
6SN7 ..... **0.69**

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Tuckahoe 3-0044

for now we have some good information on the St. Louis gang, with WØZIS reporting. Tuesday nite is for the 144 mc'ers in the St. Louis area, with WØGHW as net control. Others that usually show up are: WØKYF, JVE, NYV, VAV, EKJ, VMY, BZH, CUP, and WØZIS. Some bending has been observed lately as WØZIS has worked W9QKF and W9HNL in Centralia, Ill., and on Dec. 29 Paul heard W9PCI and W9HNL who were working W9MBD in Collinsville, Ill.,—in the afternoon at that. The St. Louis 144 mc'ers would like skeds with any one interested. WØZIS is using a 522 driving a pair of 826s, 4-element beam and a VHF-152 ahead of a KP-61.

In Orlando, Fla., W4QN, has a 522 transmitter and 6AK5-6J6 converter, and says that activity is picking up around the city.

U-F-H Notes

Still nothing about the 235-mc. spectrum, although in a coming issue of *CQ*, W5AJG has a lulu of an article on converting the ARR/1 homing beacon converter, which covers 235–250 mc "as is" and has 4 acorn tubes in a nice slug-tuned arrangement. Perhaps this will perk up things on 235 mc.

In Albuquerque we find some nice activity on 435 mc., with these active: W5IFF, W5FAG, W5FJE, W5KYF and W5LQS. Signals seem to be as good if not better than on 144 mc., out there with all the high mountains the strongest signals between stations are almost never obtained with the beams pointing towards each other.

SCRATCHI

(*from page 10*)

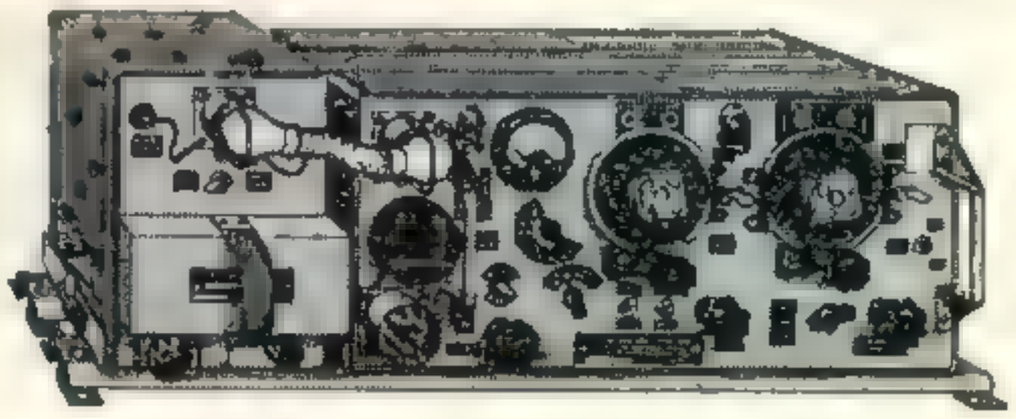
The Scratchi antenna system are working so good that I are even working out on other bands, and in no time I are running out of scratchi paper to keep track of all the contacks. Funny thing, Hon. Ed., find are not able to raise anybudy in New York city. Are you thinking maybe this on acct. all the telefone lines and railroad tracks are undergrounds?

I are doing sum more playing around and are finding that every time I go on the air the telefone bell rings. Itchi also telling me he are hearing me on bc radio, not all over dial but just on network stations. Wondering how such monkey bizness happenings? You know, Hon. Ed. this ideas are having reel stewpendous possibilities. I are thinking of leasing long-distance telefone wires from here to Maine and here to Florida, and feeding them like Vee-beam. Only one thing have me puzzled. The telefone wires follow surface of earth and curvature of earth not taken into account in handbook formulas. Are you having dope on Vee-beam what are 50,000 wavelengths long on each leg? This are for 80 meters natchurally.

Farmer from next door just come into see Itchi as he are finding his cows with hair all burned off where they rubbed fence so I am closing hastily,

Respectively yours,
Hashafisti Scratchi

MARCH SPECIALS!



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B-19 Mark II complete tank installation with all spares. Packed for export. Instruction manual, etc. N-1 ..... **44.95**

Headset & Microphone used with Mark II, N-1 **1.95**

BC348 Receivers, 200–500, 1500–18,000 KC. Complete with 28 V dynamotor & tubes. U-N, **$49.95**, U-1, **$44.95**, U-2, **$39.95. Add $20.00 for conversion to 115 volts A.C.**

BC274 Receivers, 200–500, 1500–18,000 KC, Complete with 14 volt dynamotor & tubes. N-1, **$64.95.** Add $20.00 for conversion to 115 volts A.C. (NOTE: The BC224 is identical to the BC348 except input voltage)

SCR522 Specials
Two meter transmitter-receiver with tubes N-1, **$24.95;** U-N **$17.95,** U-1 **$14.95,** U-2 **$12.95.**

BC1206-C Setchell Carlson Beacon Receiver 28 volts D. C. 195–420 KC, 5 tubes. N-1 ..... **4.95**

BC474 with tubes, N-1 **$37.50** with manual: N-2 **$32.50;** U-1 **$27.50;** U-2 **$22.50;** U-3 **$18.50.**

181A Selsyn Compass Indicator U-1 **1.50**
Companion Transmitter Selsyn U-1 .. **1.50**

BC733D Aircraft Glidepath Receiver N-1 ... **19.95**
(Approved by C.A.A.)

SCOOP: MN26 Radio Compass Receiver 150-1500 KC U-1 **$18.95;** U-2 ..... **14.95**

SCR610 FM 10 meter transmitter-receiver, 6, 12 and 24 volt power supply with tubes U-1 ..... **14.95**

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PE103A 6-12 volt dynamotor, N-1 ..... **8.95**
CD501A cable for PE103A-BC654A, N-1 ..... **1.95**
GN45A Handcrank Generator and stand, N-1 ..... **4.95**

BC357J Beacon Receiver, 75 MC, tubes N-1 ..... **$ 3.45**

General Electric 6RB6B17 Tungar Battery Charger; 12 battery, 12 amp.; 24 battery, 6 amp. N-1 ..... **$67.50**

Transformer 600-0-600 @ 300, MA 17 V @ 1 A N-1 **5.95**

Signal Box Kite, postpaid **2.50**

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5BP4 Cathode Ray Tube N-1 ..... **2.50**
3AP1 Cathode Ray Tube N-1 ..... **2.25**

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HS-33 600 ohm headset N-1 ..... **1.29**

Extension cords, PL55 plug incl N-1 ..... **.40**

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6-METER CONVERTER

(*from page 41*)

are as follows.

Plate voltage	250 volts
Plate current	10 ma
Screen voltage	250 volts
Screen current	1.45 ma
Self-bias resistor	150 ohms
Plate resistance (approx.)	0.5 megohm
Mutual Conductance	7700 μmhos
Capacity—grid to plate	0.02 $\mu\mu$f Max.
Capacity—input	6.2 $\mu\mu$f
Capacity—output	4.9 $\mu\mu$
Input resistance at 50 mc	10000 ohms
Equivalent noise resistance	700 ohms

The EC52 is a triode whose filament drain is 0.43 ampere. The mutual conductance is 6500 μmhos, at a plate current of 10 ma.

6AK5s are suggested as substitutes for the EF54 and a 6C4 can be used in place of the EC52.

PARTS AND PRODUCTS

(*from page 58*)

of "memory" applications, where vibration is not severe and simple contact combinations suffice, a high sensitivity adjustment is provided and power requirements are as low as a few milliwatts. In this type of service the relay can be tripped by a 50-volt charge on a $\frac{1}{4}$-μf condenser.

Technical Publications

The new edition of the RCA Receiving Tube Manual-RC-15—is just off the presses.

In addition to greatly expanded coverage in its regular sections, the RC-15 presents many new features, the result of rapid progress in electronics during the war years. These include information on new developments in FM, up-to-the-minute technical data on miniature receiving tubes, and valuable installation and application information on kinescopes for television broadcast receivers.

The sections on tube and circuit theory have been expanded to include new information on ratio detectors, discriminators, limiters, and multivibrators. Also included in these sections are formulas, and examples, for the calculation of power output, load resistance, and distortion for class A_1, AB_1, AB_2, and B audio amplifiers of both the single-ended and push-pull type using either triodes or pentodes. The section on resistance-coupled amplifiers has been augmented to cover 83 tube types and rearranged for user convenience.

The Receiving-Tube Classification Chart has been brought up to date. In this quick-reference chart, receiving types are classified by tube function and cathode voltage; types with similar characteristics are bracketed. Supplementing this chart is a separate listing by function of only miniature types to provide easy reference to these new and important tubes.

Readers can obtain a copy of the RC-15 from RCA Receiving Tube Distributors, or by sending 35 cents to Commercial Engineering, RCA Tube Department, Harrison, N. J.

Purchasers of Sylvania's new technical manual containing a wide range of tube application data will receive supplemental data sheets issued with the announcement of new tube types.

Supplemental data sheets are punched for the plastic binding and are inserted in the News as they are issued. This manner of handling provides an automatic means of keeping all manuals up to date at no extra cost. Supplementary sheets are printed to match pages of the original manual for uniform appearance and the elimination of loose data or data in several binders. Recent supplements covered technical data on 1B3GT, 1V5, 1C8 and 1W5 tubes.

Catalogs

Allied Radio Corporation, Chicago, announces the publication of a new 48-page supplement to their regular master catalog.

The new supplement No. 114 as well as Allied's regular 164-page master catalog No. 112 can be obtained without charge from the Allied Radio Corporation, 833 West Jackson Blvd., Chicago 7, Illinois.

Ward Leonard Electric Company, Mount Vernon, N. Y., announces publication of their new Catalog D-30, which fully describes and illustrates a comprehensive line of stock units in resistors, rheostats, and radio amateur relays.

The Ward Leonard D-30 catalog also presents a complete stock line of radio amateur relays for standard applications based on the practical needs of amateurs all over the world. It includes the following types: antenna, r.f. break-in, band switching, keying, overload, time delay, safety, sensitive, latch-in, and remote control relays; also Ward Leonard Transmitter Control Panels for low, medium, or high-power ham rigs, in kit form or completely assembled and wired.

A copy of Catalog D-30 may be procured by writing to Radio and Electronic Distributor Division, Ward Leonard Electric Company, 53 W. Jackson Blvd., Chicago 4, Ill.

Cornell-Dubilier's new catalog, No. 200, is a handy reference book and complete capacitor listing. It is a 24-page catalog, illustrated with detail drawings as well as halftones of more than 20 different classes of capacitors manufactured by C-D. Each kind is described in detail, both as to construction and service, and illustrated. Many also are supplemented by the working drawings. In addition, each type is listed with its construction details, and list and net prices. Catalog No. 200 may be obtained by writing to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

SELSYN DRIVEN V. F. O.

(*from page 19*)

r-f lines around the shack and making the v.f.o. and transmitter final stages an integral unit.

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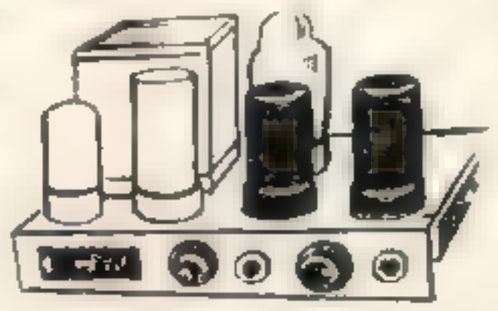

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ment shows in the lead photo. The control Selsyn is mounted in a convenient spot on the operating desk. It is very desirable to remove the a-c voltage from both Selsyn motors except when changing frequency. When this is done, however, it becomes necessary to prevent movement of the control wheel which would otherwise be free to turn and get out of synchronism with the driving motor in the v-f-o unit. Probably each constructor will have his own ideas as how best to accomplish this. In our unit a mechanical brake inside of the control box is used. The details of this brake are shown in *Fig. 7*.

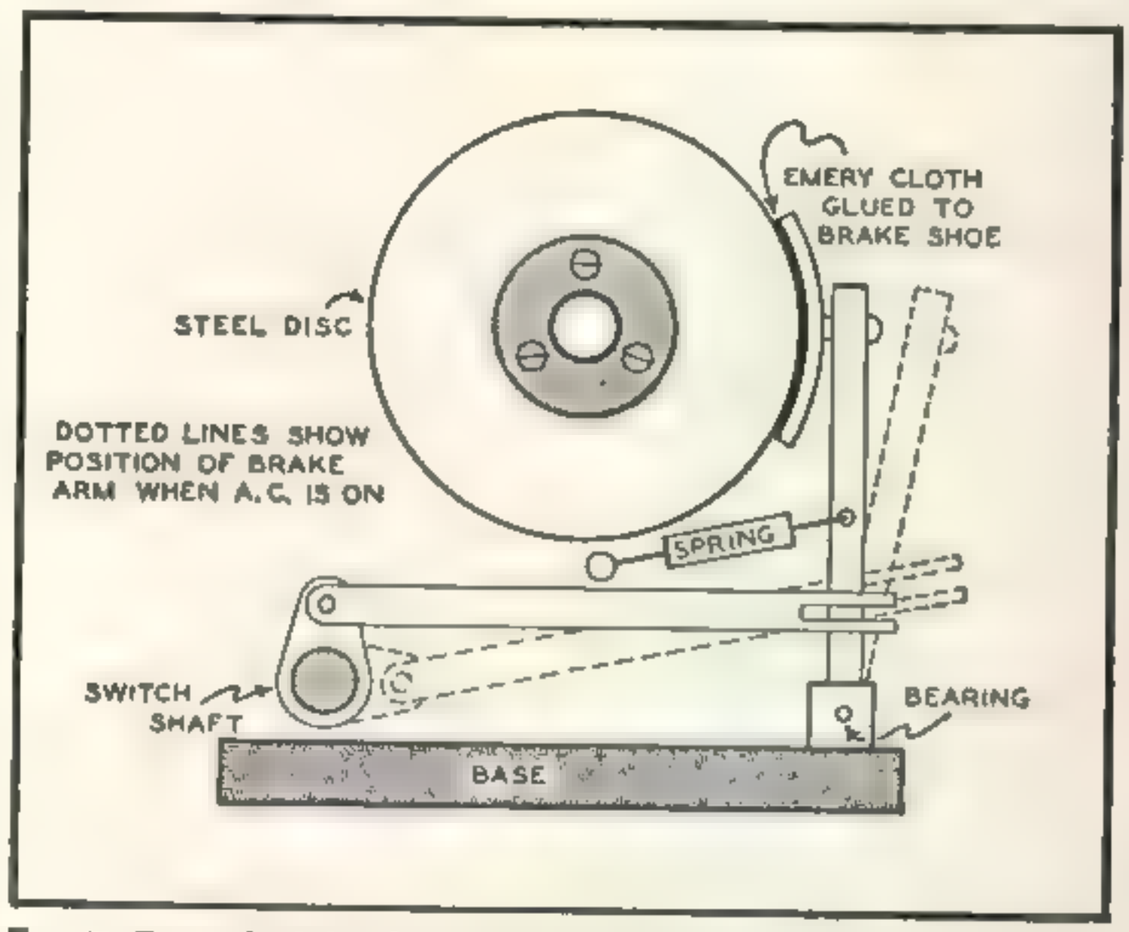


Fig. 7. Detail of the Selsyn brake at the operating position.

The brake consists of a ¼" thick steel disc about 2½" in diameter. This is attached to the shaft of the transmitting Selsyn. A brake shoe is actuated by a small crank and rod assembly fitted to the shaft of the a-c power switch. Turning on the a-c voltage lifts the brake shoe from the steel disc allowing the Selsyn shaft to be rotated freely. Turning off the a-c power releases the brake shoe which is pulled down on the disc by the coil spring. Several alternative methods might be used, according to the initiative and the facilities at hand. Among these is an external clamp to the control knob, or a solenoid operated brake shoe wired in parallel with the Selsyn rotors and the a-c power switch.

While this is certainly not the simplest type of "crystal substitute" by any means, the results obtained seem to have justified the work of building it. The signal is always extremely stable and has never failed to get a T9X report with no trace of chirp or click.

BOBTAIL BEAM

(*from page 23*)

maximum radiation at the greatest practicable distance (and in no case closer than one wavelength).

The array can be "pruned" to frequency simply by altering the length of the two outside vertical elements, as it is possible to compensate for other dimension errors (over a limited frequency range) by adjusting just these two elements. The two should be trimmed together, so that they always are of the same length. However, as noted above, good

results will be obtained in almost every case if the array simply is cut to the specified dimensions and left alone.

Feed Methods

The simplest method of feed is to locate the array so as to permit bringing the feed point (the lower end of the center vertical element) right in to the transmitter, and then voltage feed it by means of a suitable Pi or L network. For best suppression of harmonics and other spurious radiations, however, the arrangement of *Fig. 2* is recommended. It also is preferable if one has hopes of getting on phone, as it keeps the "hot stuff" well away from the transmitter, a necessity on phone if high power and a high-gain speech amplifier are employed.

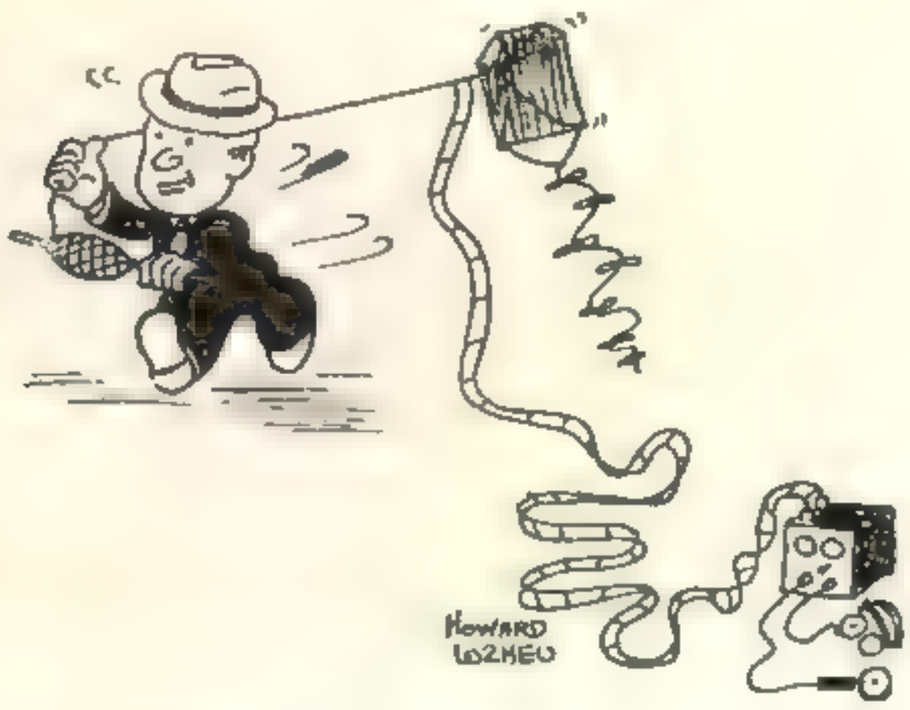
This arrangement also is recommended if a 36-foot center element will not reach the transmitter, as the coax can be any reasonable length and the antenna tank therefore placed anywhere in the room (or even elsewhere, though this makes it awkward when the antenna tank must be retuned).

Seventy-ohm coax is slightly preferable to 50 ohm, as its use cuts down the impedance transformation ratio a bit and makes it easier to obtain the proper loading with good efficiency. However, either type is satisfactory.

Condenser *C1* should have a maximum capacity of about .00025 μf, and the inductance of *L2* should be such that *C1* resonates with the plates nearly all the way meshed. If the tank is made too low C, it will be difficult or impossible to load the coaxial line properly, regardless of the number of turns on *L1*. The minimum safe spacing for *C1* can be determined by taking the square root of the maximum *peak output* power in watts and multiplying by 10. The answer is in thousandths of an inch.

The number of turns in *L1*, and the coupling between *L1* and *L2*, should be adjusted so that when *C1* is resonated the load on the coaxial line is approximately equal to the surge impedance of the line. All further loading adjustments are made by varying the coupling at the transmitter end of the line. In this manner the coax is operated under substantially "flat line" conditions.

A large portion of the band can be covered with one setting of *C1*. However, for proper operation the condenser should be readjusted when going from the low end to the high end of the band. A simple procedure is to log the optimum setting of *C1* at 7000, 7150, and 7300 kc, using an improvised indicator (oversize if necessary) which can be read from the operating or transmitter tuning position. When moving around in the band it then is a simple



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matter to note whether *C1* should be touched up, and if so to optimize it without "fishing around" for the correct setting.

The ground connection for the antenna tank coil need not have low resistance, and need not be especially short, as the current flowing in the ground lead is comparatively low and a moderate amount of reactance in the ground connection can be tolerated. The reactance can be minimized by using a heavy conductor for the ground lead.

If the coaxial line from antenna tank to the transmitter is not over about 10 feet long, no ground connection on the antenna tank is required. Grounding the outer conductor of the coax to the transmitter frame and to the bottom of *L1* usually will suffice. A simple check on the adequacy of the ground arrangement can be made by testing the bottom of *L1* for "fire." When the system is working properly, the bottom of the antenna tank will be "stone cold" with respect to r-f voltage.

It should be emphasized that when using coaxial line and a common antenna system for both transmission and reception, only the center conductor need be switched, all outer conductors being common. If the relay is of the double pole type, the contacts can be paralleled to increase the power handling capability.

Of possible interest to amateurs short on ground space for antennas is the fact that a 40-meter Bobtail does a creditable job as a *general coverage* antenna on both 20 and 80. On either 20 or 80 the antenna will perform better in some directions than others, but nevertheless will put out a usable signal over most of the compass. The antenna tank constants must be altered, of course, to hit 20 or 80. If the antenna is to be used on 80, a .0005 variable is recommended at *C1*. The L/C ratio should be about the same on 20 and 80 as that recommended for 40-meter operation.

75-Meter Adaptation

The Bobtail also will do an excellent job of laying down a DX signal on 75-meter phone if cut for fundamental operation on that band, though the required ground space and pole height makes it prohibitive for many amateurs. The dimensions for 75-meter operation can be determined by multiplying those of *Fig. 1* by a factor of 1.82. An antenna of this type at each end of the circuit, in conjunction with a moderate amount of transmitter power, makes transcontinental 75-meter QSOs a possibility if not actually a probability almost the year around, provided the operator is adept at dodging QRM from stations in the same area, or else stays up till they have given up and gone to bed.

The One Fly

It is only fair when expounding the merits of an array to mention also the shortcomings and disadvantages. The one fly in the ointment as far as the Bobtail is concerned is the fact that its vertical polarization makes it a "stinker" from the BCI standpoint. So unless you have an isolated location, you can expect to get a few calls. The method of disposing of these to the satisfaction of all concerned will be left to your own ingenuity. The author has found that unless one can talk fast, disarmingly, and convincingly, the best bet is a batch of wave traps and line filters all made up and ready to install.

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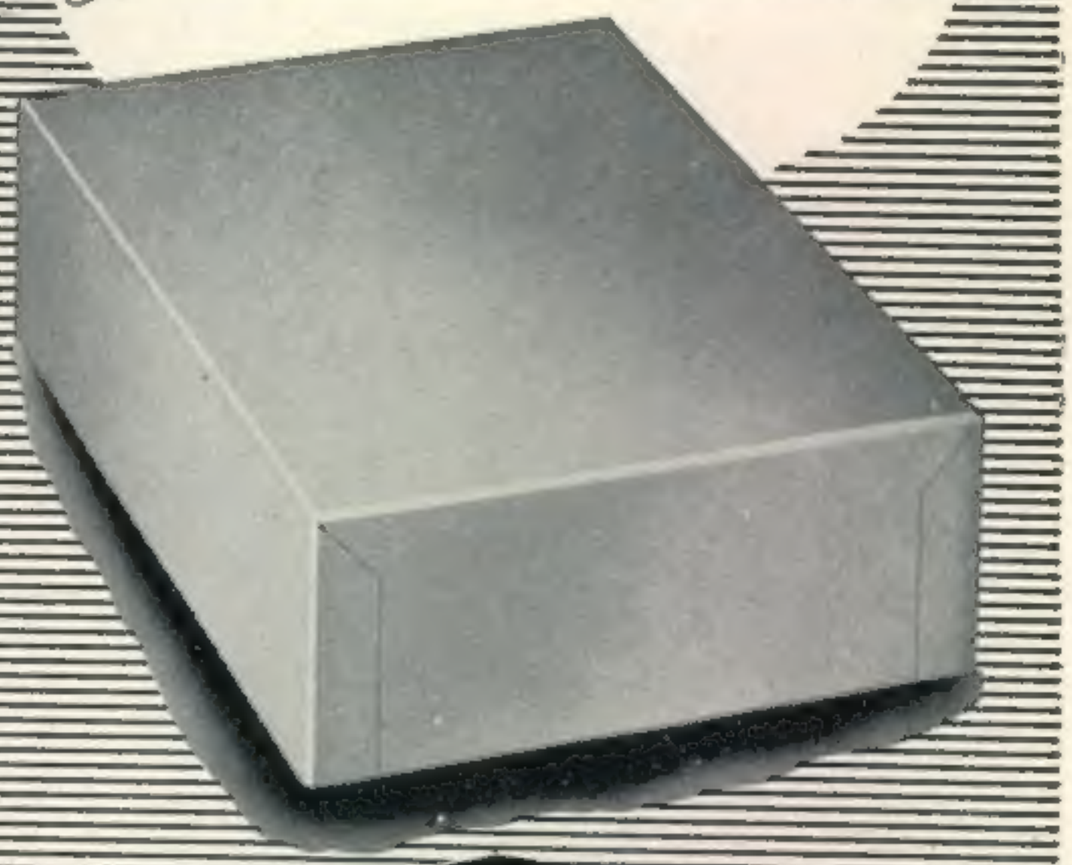

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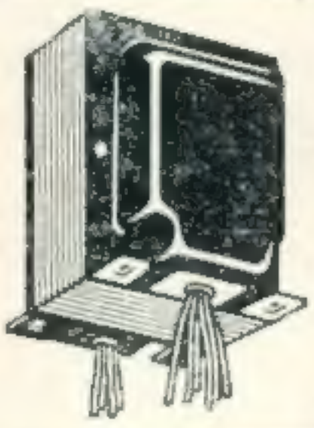

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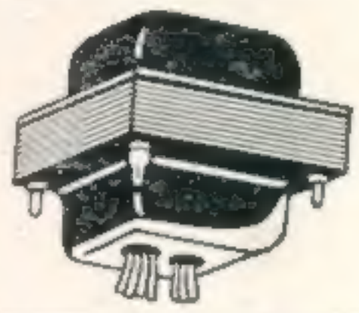

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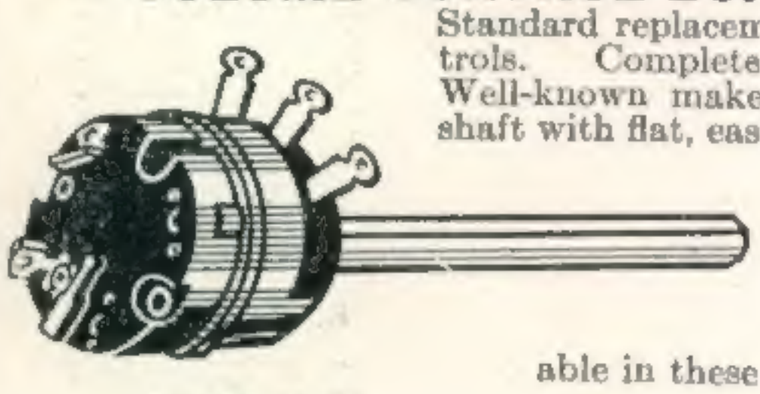

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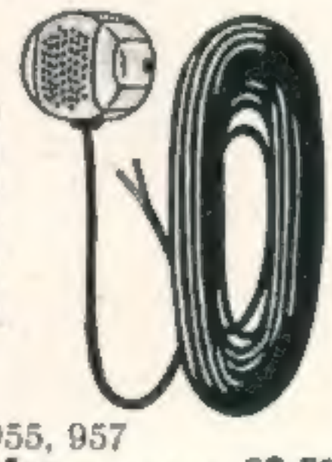

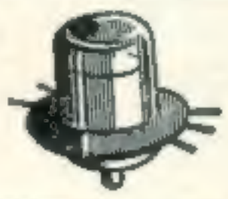

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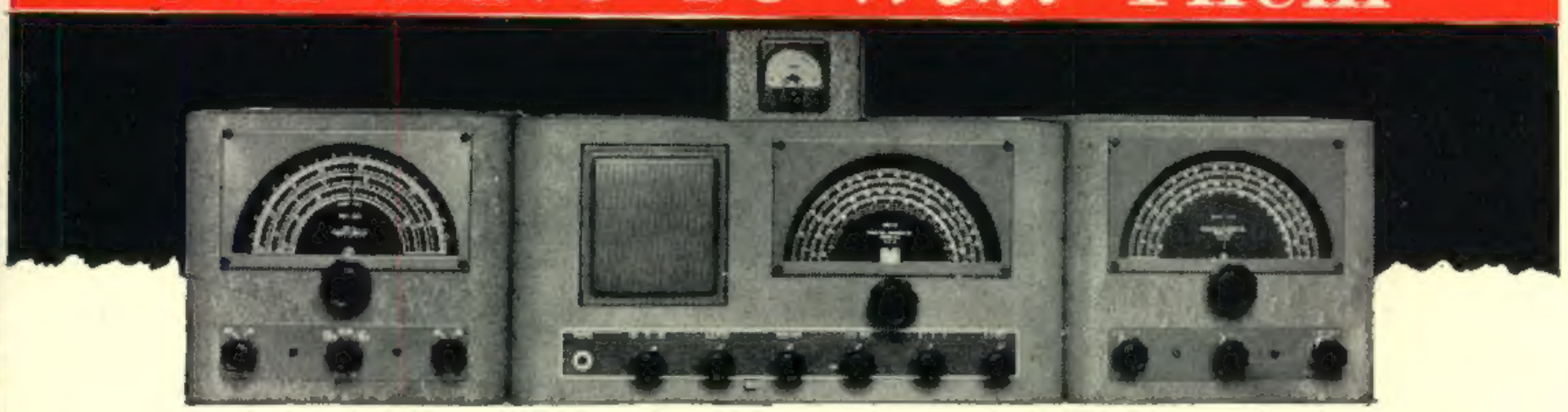
"To Work Them . . . You Have To *Hear* Them"



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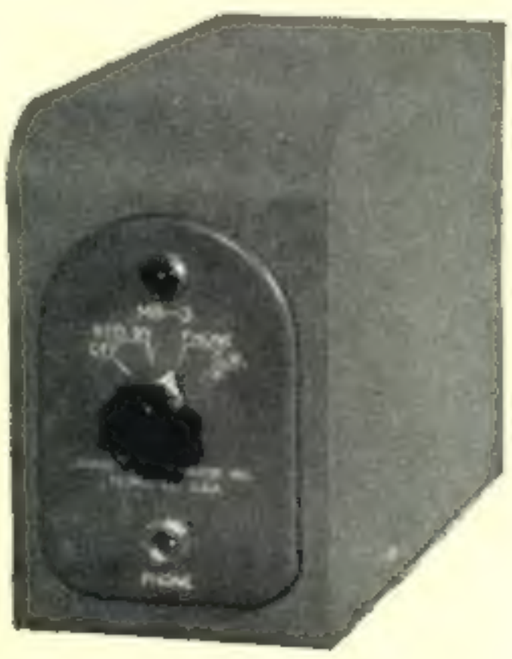

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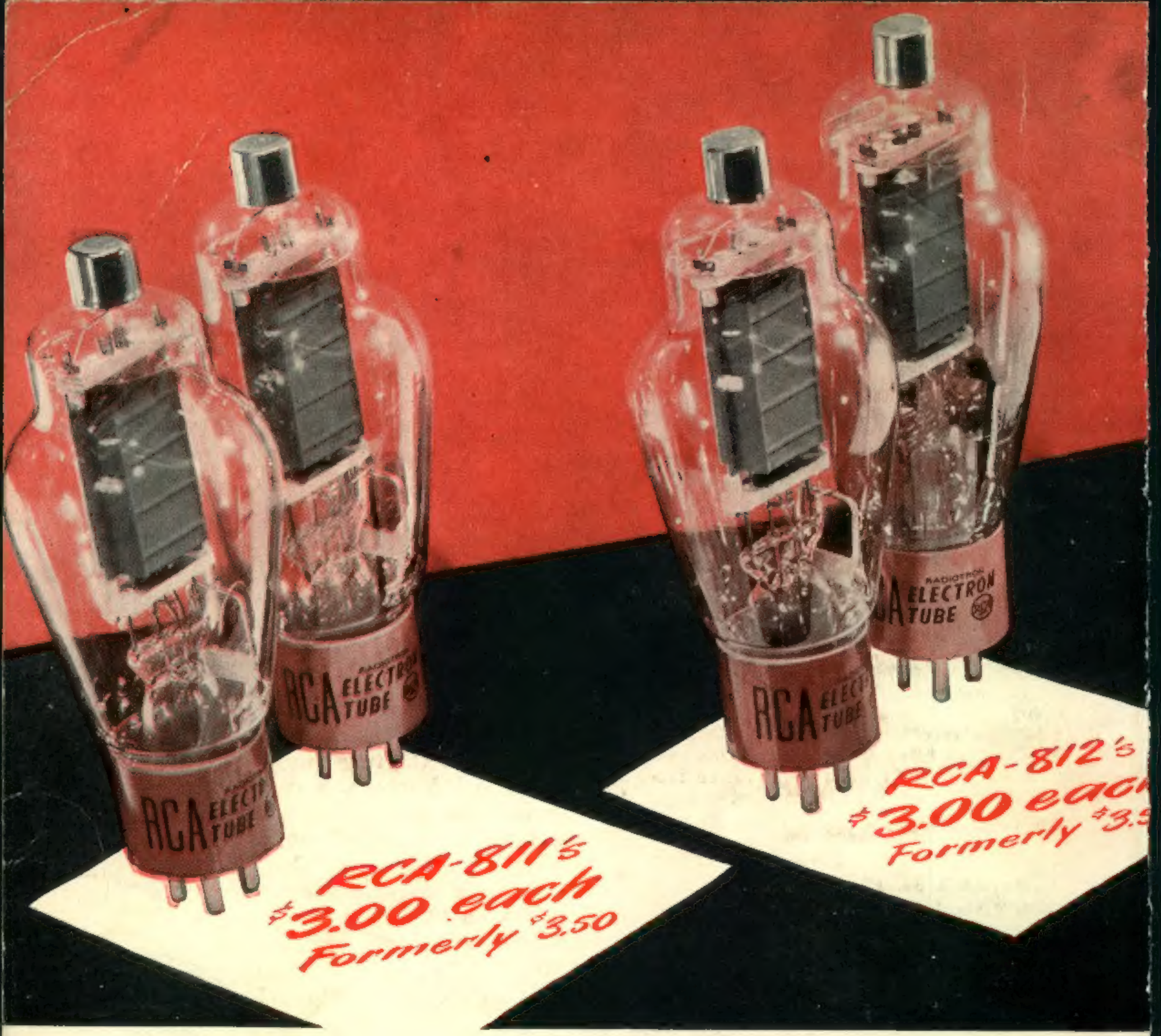

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